SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

THE SOUTH STAFFORDSHIRE FLOODED MINES.

SIR,—Yesterday a very worthy gentleman in London wrote me on this subject giving me a quotation from a letter he had just received, as under:—

"The fact remains the same that no capitalist in his senses would look at that district (South Staffordshire) as one wherein to invest his money. We admit that several mines are not flooded, and do not appear as if they would be to many people; but that they will be very soon under water cannot be doubted—it is gradually rising, and overflowing the whole of the Thick coal measures, and now there will be no power capable of preventing it; it is only a question of a short time. Possibly a few small places here and there, being above the level water, will ultimately, we assume, escape inundation; but that remains to be seen. We are thoroughly well acquainted with the whole district, and know what we state to be correct, even were we not borne out by the opinions of practical men who know the district thoroughly."

I have given the quotation only for the purpose of contradicting it, and informing the gentleman who wrote it (to alarm my friend) that if he supposes South Staffordshire mines to extend only from Wolverhampton to Tipton, Gold's Hill, and Darlaston, which is the widest extent the best judges consider it possible for the flood to reach, he has taken a very limited view of our coal field.

In a considerable portion of the flooded district there never was any Thick coal to get, whilst in the other part the Thick coal has been got, and nothing but ribs and pillars left; these in many of the old collieries have been worked over and picked several times. Is the whole of Oldbury, Sandwell, West Bromwich, Rowley, Dudley, Halesowen, Corngreves, Cradley, Brierley Hill, Himley, Gornal, Cannock Chase, Rangley, Bloxwich, Aldridge, &c., connected with this little district of flooded mines? The answer is—No, and never can be. A glance at the map will show that the learned gentleman is not so well informed as he ought to have been before undertaking to give an opinion on business so important. In this case it is clear that "A little learning is a dangerous thing." The district now flooded, and as we think will be for some time, has long been worked for coal—some places on the outcrop from a very early period. The gentleman says it is "overflooding the whole of the Thick coal measures;" and, above all things, he takes credit to himself for knowing all this. A wilder, more foolish, and unrighteous statement was never made nor written by anyone.

It was stated a short time ago before a Committee in Parliament that during the year 1873 we had imported into this district minerals to tha extent of 3,000,000 tons, since which we have not had near so much in any one year. This is accounted for from several causes—our consumption in the iron trade has been much reduced, and many of our old pits have been put into a more efficient state; new collieries in Thick coal and other measures opened, &c., notwithstanding which we continue to receive considerable quantities of minerals, coal, coke, &c., from other distant districts, which must convey one fact to the thinking man—that those having good mineral properties, collieries, &c., in this district have an advantage over those having similar property in distant counties to the full extent of delivering their produce into this market. The Thick coal of South Staffordshire is not all gone; nor is all or any part, except in the area of broken mines before alluded to, at all threatened with inundation. Our great fame in Staffordshire as makers of best iron has been obtained mainly through the purity and woody character of our coal, of which Lord Dudley and many others have an abundance left—so much that I conclude that long after our knowing friend has forgotten all he ever knew or will know, and all of us now living are gone, there will be getable coal in Staffordshire outside "the flooded little old district" for our best ironmakers and others, and the matchless brands of best Staffordshire iron continue the admiration of those who know them and use them, and the envy of those who cannot produce a like quality. R. PLANT.

Foster House, Wordsley, near Stourbridge, June 6.

P.S.—For second quality of Thick coal and lumps we here pay at the pits 11s. per ton; in other districts they pay 6s. to 7s. per ton. To the iron trade a little easier terms are given at all our collieries.—R. P.

PREVENTION OF COLLIERY EXPLOSIONS.

SIR,—I had really hoped to arouse a friendly discussion upon the merits of compressed air in coal pits over the present means of ventilation, by calling attention to the extreme cases of Hartley and Tynewydd; but, instead of this, one gentleman devotes his talent to upset the use of the barometer, and another to the effect that atmospheric pressure has little or nothing to do with the escape of gas in collieries.

It is true that in a working pit the condition of the atmosphere is variable, and not only is it possible but exceedingly probable that the "thousand and one" little difficulties alluded to by Mr. Warburton may at any time foul the pit to an explosive point without a moment's warning. Hence it is that he condemns the barometer for not indicating the danger until, as he alleges, the mischief is done. To get over this difficulty, I will assume a pit to be filled to compression—say to the extent of 17 lbs. to the inch—and if a barometer be conspicuously placed within the pit I respectfully ask that gentleman whether such an instrument would fail to indicate any variation of pressure, and whether the "thousand and one" other causes of danger would not be materially reduced?

If this be so the question must arise whether or not such a supply can be obtained and regulated so as to ensure its invariable presence at all times? I not only contend that it can be infallibly accomplished, but that it will not in any way interfere with the working of the colliery, nor cost more than a nominal sum, although it must secure an enormous saving in working expenses.

I have laboured for years to prove this, but as yet without avail as regards the prejudice in favour of the "furnace." All its admirers and supporters would do well to reflect upon the following words of the greatest literary authority of this or any other country—

> "Our doubts are traitors,
> And make us lose the good we oft might win
> By fearing to attempt."

I need not go beyond your own columns to prove my untiring zeal for the appointment of Government Inspectors of Mines, and I possess abundant testimony of other leading journals as to my disinterested motives in seeking the general amelioration of the condition of British miners and all dependent on their dreary labour for subsistence. I, therefore, justly feel that such inspectors, of all other men, ought to give some encouragement to my views if they cannot dispute the accuracy of my propositions; and as regards owners and managers of collieries in general, I respectfully but fearlessly remind them that during the last 25 years there is not one who has attempted to refute my statements, either as regards the cause of explosions or the means which I have long and consistently advocated for their prevention.

Adverting to my former arguments both as regards Hartley and Tynewydd, I still maintain that with compressed air in either to the extent which I produced at Scotswood the 204 victims in the former pit and all in the latter would have been saved. As every effort to pump the water out of the Welsh pit failed, I may ask why no attempt was made to combat this difficulty by natural laws? The application of air to compression in the inundated pit, or by exhausting it from the old workings, the water must have receded so that everyone apparently entombed might have walked in safety to the shaft; as it was, however, poor Morgan fell a victim to the sudden escape of the pent-up atmosphere, and then my proposition as to the mode of dealing with pit-air under compression was resorted to, and the next batch of our fellow-creatures was saved.

As the projector and founder of the Miners' Friend Association, afterwards named the National, &c., I beg to remind Mr. Smith, the present President of the Ironmasters' Association, that he is in error in stating before the Select Committee of the House of Commons recently that "the best way to avoid accidents in mines is to acquaint the miners with their individual responsibility," &c. This has been tried, and signally failed; therefore, the only remedy must be found in a means of preventing an ignorant or reckless miner from firing a mine, even if so disposed, and this can only be done by securing at all times a sufficient supply of God's free gift in the form of atmosphere to dilute all gases below an explosive condition, in which case an open light would be as safe as the most modern of safety-lamps.

Now that an attempt is made to fix upon employers the responsibility of providing compensation for injuries to their servants it behoves them to put it out of the power of those they employ to ruin either owner or manager by culpable neglect; and if any lingering doubt should still remain as to the efficacy of compressed air as a substitute for the inadequate supply by the maximum power of the furnace, I respectfully but fearlessly submit that it will effectually exclude all other bodies out of the space it possesses, and, therefore, neither gas nor water need longer be viewed as the miners' dread.

By way of reducing the gas pressure, I believe it might be utilised in lighting up the main passages, with equal safety as the use of naked candles in some pits considered to be safe, and at stated intervals, when no light exists in the pit, the gas might be suffered to escape if it could, and blown off through the upcast-valve, with all exceeding a natural atmosphere.

In conclusion, I venture to suggest that in lieu of the varied temperature in the present means of obtaining it the air might be supplied at any degree of heat required both summer and winter, so that another cause of danger can thus be easily removed.

I have been thus plain throughout in order to make myself clearly understood, but perfectly free from intentional offence to anyone; the question of preserving human life is highly important, and this being my only desire should excuse my freedom of expression, and entitle me to the co-operation of mining engineers and colliery owners in general. C. COLWELL.

Southtown, Yarmouth, May 30.

THE USE OF THE BAROMETER AND THERMOMETER IN CONNECTION WITH COAL MINE VENTILATION.

SIR,—It would appear from the elaborate paper of Mr. Warburton that mine managers have paid too little attention to the thermometer, especially as to its indications in the interior of a mine. Up to the present time the thermometer has not—that is, its indications have not—received that attention they deserve. We are not aware that any record has been published of the temperature of mines at various points for any lengthened period. Our impression is that in the bulk of the workings the fluctuations are comparatively unimportant. At the bottom of a shaft of moderate depth (100 fms.) we have observed that the temperature varies from 64° in winter to 74° in summer, whilst at the bottom of the upcast shaft in the same mine the temperature is uniformly 64° all the year round, the air having traversed several miles before reaching that point. In one of the deepest mines in Durham the following readings were taken, the depth of the seam worked being 300 fathoms:—Winter, bottom of shaft, 52°; summer, bottom of shaft, 63°; summer, face of workings, 75°.

The statement that when the barometer falls the gas has advanced previous to the indications of the instrument is no doubt correct, but that does not detract in the least from the value of the barometer. That mode of putting the question, indeed, is rather calculated to mislead. If we suppose that the barometer falls (say) ⅛ in. in one hour the gas cannot at that time have advanced much, but warning has been given, and if the barometer continues to fall at that rate during a period of six hours a very serious fall will be the consequence, and gas may be expected during and after the fall. More rapid falls than this have occurred, but they are rare. During the night preceding May 28 last a very rapid and great fall took place on the Tyne, and a serious explosion of gas occurred in a lead mine near Hexham, when several men were much burned. About the same hour a man was killed at Nant-y-Glo by an explosion. If we are to put down the occurrence of explosions after the falling of the barometer as simply coincidences, they are certainly coincidences of a most remarkable kind. However, there is no doubt that more extended observations in this most intricate question will throw more light on it, and more reliable conclusions may be arrived at in time. A. R.

CANADA HONDA GOLD WASHING COMPANY.

SIR,—In last week's Journal, among the Companies Recently Registered, my name appears as acting on behalf of a certain Canada Honda Gold Washing Company. I enclose you copy of a letter I addressed to the solicitor of the proposed undertaking on the 23rd ultimo, declining to act for it. As my name has, therefore, been used without my authority I shall be obliged by your giving this disavowal a place in your next issue. MOWBRAY WALKER.

Winchester House, Old Broad-street, June 2.

Winchester House, Old Broad-street, May 23, 1877.

SIR,—I must cease to be trustee in connection with the proposed Canada Honda Gold Washing Company (Limited). Be so good, therefore, as to cancel my name in that capacity at once, and oblige—MOWBRAY WALKER.

C. D. Watson, Esq., King's Arms-yard.

THE NEW ELDORADO.

SIR,—On concluding my last letter from this place I promised to write again after returning from the Bear Buttes silver mining district. Having recently returned, after an extended trip in that district surveying, I must say there are some good mines there. In my last I think I spoke of the veins as being true fissures. Well, the mines are not developed enough yet to prove whether they are true fissures or no; but it is my opinion, however, that the veins are horizontal, with the sand-rock for a foot-wall and a kind of porphyry for the hanging-wall. There are large bodies of ore already in sight—some of it very high grade ore, running up into thousands of dollars per ton. The ores are principally galena, yellow carbonate, chloride, horn-silver, and a little antimony; on an average, I might say it will work $100 per ton. The district is extensive, holding forth many inducements to capitalists. The ores are rich, easily mined, and a good deal of them in sight. There are no reduction-works there at present, but will be sometime this summer. The Florence Mine was sold three weeks ago for $100,000, and capitalists are beginning to turn their attention towards the silver mines in Bear Buttes; but the capitalists that are here as yet are from the Eastern States—they do not understand the business, and are so scared of being swindled that there is no go-a-head or life here, as there is in some of the more western mining camps of Nevada and California. English capitalists, with their experience, could easily appreciate the wealth and value of such mines. Some of the mines, no doubt, will have some litigation, having conflicting titles, while others have their titles clear. There are several rich mines on Mineral Hill; the Treasure Mine, one of the richest, will probably be in litigation with the El Refugio, Hardscrable, and Caribou Mines—the last three being owned by one company. But I think the four could be purchased for $100,000. The Treasure Mine has 300 tons of ore, sorted in three different grades, valued at $40,000, and as much more already in sight in the mine. The ore is there, and also the silver; all that is wanted are reduction works to make the mines dividend paying. Capitalists are slowly purchasing the gold mines from their original owners; but the capitalists that are here expect to see $50,000 worth of ore in the mine before they conclude to give $25,000 for it. Mills are coming in, and putting up slowly; but I see no such mills here as are in California or Nevada—those here being very light and small; in fact, Eastern capital has had no experience in mining for the precious metals, and when a man or company do not understand what they undertake to do they are very apt to be a little too cautious for their own welfare A company or companies could get mines here showing enough ore in sight that will run $20 to $50 per ton, enough to keep a 50-stamps mill going for a year or two. Some leads are very wide. The Golden Star lead averages 50 ft. of good pay ore; the Homestake, 100 ft.; the Star, 150 ft.; and Caradon, over 100 ft.—the greatest portion of which is good pay ore. True, the mines I have spoken of are not developed enough to prove that the veins will continue this width for any great depth—still some have shafts down 50 and 60 ft., and show thousands of tons of pay ore. The only good offer I have heard of that has been refused is one for the Father De Smet Mine, of $200,000, the same mine being purchased eight months ago for $60,000 by the company now owning it from its original owners. This mine seems to be a whole hill of rich milling gold quartz, most of it showing free gold, whereas most of the gold in these mines is fine flour gold. Another man refused an offer of $100,000 for a cement gravel mine in Black Tail gulch, a tributary of Deadwood Creek, asking $150,000 for it, as he had that amount or money worth of ore already in sight in the mine. It is my opinion the mines are permanent, that the veins are true fissure veins, being in a slate formation, and if they average half so good, or even a quarter, as at the present time they are very rich mines.

The placer mines have not as yet got fairly started, there being at present too much water in the creek. There are, however, some very rich placer mines on Deadwood Creek and its tributaries; also on Gold Run. Outside these two creeks the placers as yet discovered do not amount to much, still gold is found in all the creeks and gulches of Black Hills, and any day we may hear of some new strike being made. THOMAS H. WHITE.

Civil and Mining Engineer.

Deadwood City, Lawrance County, Dakota Territory, May 10.

THE WHITE PINE DISTRICT, UNITED STATES.

SIR,—I have been solicited for copies of a letter which I published in the *Mining Journal* some five years back on the Limestones of Chile, and what I considered then would result if the Eberhardt and Aurora Company's mines were properly understood and placed in the hands of practical men. As the numbers of the Journal for 1872 are out of print, I herewith forward you the letter in question, which I have taken out of my scrap-book. After an absence of 20 years from Chile, I inspected many silver mines which are now 1000 ft. deeper than when I knew them from 1851 to 1858. The ores from the deepest points in the silver mines in Chile, and recently brought by your humble servant from Chile, prove that for silver mining no formations produce such rich ores and such quantities as these limestones; therefore, I desire to bring forward some facts to prove the fallacy of supposing that such formations are pockety. The whole difficulty consists in simply having a practical acquaintance with them, and to know how to carry on the underground operations. Since I was last in Chile $120,000,000 have been produced by silver mines in limestones. H. SEWELL.

10, *Upper Westbourne-terrace, London, June 5.*

THE LIMESTONE FORMATIONS OF CHILI, AND THE EBERHARDT AND AURORA COMPANY.

SIR,—Having had the management of silver mines in Chili, and in true fissure veins, in stratified limestone formations, for about eight years, subsequently also for two years in Mexico and Spain, producing precisely the same class of ores as those of the White Pine—chlorides of silver, called by practical miners horn silver—I believe a few observations and data on the above formations may be found useful in furthering the interests of mines in like formations in the United States, for until recently, comparatively speaking, they were not known here.

The experience in silver mines in stratified limestone formations in Chili dates as far back as 1808, at which period the silver mines of Agua Amarga, province of Huasco, were discovered. The celebrated mines of El Doctor, in Mexico, likewise in similar formations, were worked for about 30 years, and produced some $40,000,000 worth.

In 1836 an Indian, of the name of Juan Godoy, chasing some guanacos in the sierras of Copiapo, in Chili, discovered silver mines. Accidentally losing his way he was forced to camp out for the night, and to collect wood for a fire, which he had to keep up during a great part of the night in consequence of the cold blasts from the Andes. He chose, as is usual, a spot where he could protect himself—namely, a reef that stood out boldly from the ground, or what are called by the miners large croppings. Great was his surprise in the morning on rising at finding large pieces of native silver around the spot where the fire had come in contact with the croppings. It was soon proved by those who set out to inspect the wonderful riches found by the Indian that great masses of horn silver had been discovered accidentally in stratified limestone formations, and that the native silver was due simply to the fire which had come in contact with the ore.

These mines were vigorously worked from 1836 to 1848, and kept some 12 mills constantly supplied. The crushing was carried on by so-called Chilian mills and the patio amalgamation. In 1838 Mr. Stevenson, an English gentleman, was the first to make an improvement for working these free milling ores, and invented the tinas, or pan, system of amalgamation, which was exported from Chili to California in after years. Everywhere I have noticed that these formations produce free milling ores at surface, to a depth varying from 50 to 250 ft.

In one district alone in Chili, called Chanarcillo, it was ascertained by the dues paid to the Government that the amount of silver produced from these formations in about 12 years reached the sum of $20,000,000, and this from the free milling ores taken from surface to the depth of 250 feet.

About the year 1849 these ores gave out completely at the above depth, and in a most sudden way, most discouraging to every mine owner, so much so that the Government granted them leave to "disfrutar," or take out all the arches, or pillars, that the mining laws enforce to prevent the mines from caving in; and this is only granted after the Government mine surveyors have officially notified that the mines have ceased to be productive.

Mr. John Sewell, an English gentleman, who had owned one of the above mines for some years, and having made a large fortune, was loth to abandon it, and determined to solve the mystery. He noticed not only the sudden disappearance of all trace of ore, but a sudden contraction of the vein from 6 ft. to about 1 in., and in many places a thin cleavage of not more than ⅛ in. For two or three years he continued his explorations; levels, winzes, &c., were driven, but with the same results; not a trace of silver in the pinched part of the lode. Later on the same applied to all the mines in the district. Sinking was continued till they went through about 280 ft. nearly perpendicular (say 83°), which was the underlie of the lode. At this period of the work he was absent in Europe (fortunately), which induced the manager of the mine to continue sinking for two months longer, awaiting his arrival to abandon the mine altogether. Within the above short period this narrow cleavage, or lode, changed as suddenly again as it had disappeared before, to a width of 6 ft. This event took place in 1851, when the writer of this took the management of the mine, and continued therein till 1857. The ores in this new strike changed completely, their composition being mostly ruby silver ores, without any trace of free milling ores. We have in Chili exactly the same change in the copper mines, from free smelting copper ores (carbonates and silicates, ores that can be smelted into bar copper in one operation) into sulphurets, under similar conditions of depth.

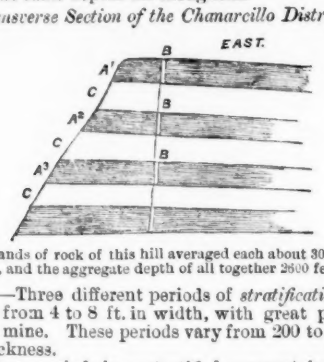
At the depth of about 600 ft., where the sudden expansion of the lode took place, the writer extracted 9½ tons of native silver, which produced 90 per cent. of their weight in pure metal on being melted down in the bar furnace. This kidney of native silver was surrounded by masses of pure ruby silver; 400 tons of this ore was shipped in 1851, in the brig Llewellyn, for sale at Swansea, Wales, and the average per ton was $2000, or $800,000 in all.

Shipments from this district continued for about four years, and the calculations of ore shipped to Swansea were about $25,000,000. Up to the year 1857 nothing was shipped that was under 800 ozs. to the ton. This was produced in the second bonanza, in the stratified limestone formations; and "Believer in White Pine Pockets" will, I fancy, be somewhat elated at these little pigmy items, which may prove useful for future guidance in White Pine. The sudden transformation from free milling ores to native and ruby silver ores at a depth of 600 ft., induced all the millowners to try all manner of experiments as to roasting and chloridising. They had graduates from Freiberg, as also practical men well versed in this branch of metallurgy, but all these failed, and in consequence the ores were shipped to Swansea. It is evident, then, that these limestone formations created amongst the smelters in England a great reputation for riches.

The difficulty which arose in Chili on the chloridisation of ores may apply, later on, to the White Pine districts when they will have

attained the necessary depth, and begin to produce native and ruby silver ores. This difficulty was caused by the heavy percentage of lime in the ore, about 90 per cent., and the amount of salt and iron pyrites required for the complete saturation of the lime, before the silver could be chloridised. As stated above, the richer ores were shipped, and the writer solved the problem for the reduction of the poorer ores (that is, of 200 ozs. to 300 ozs.), on which the freight to Europe was too great. These were smelted in reverbatory furnaces with copper pyrites, and shipped as a matt, the former with their lime fluxing thoroughly with the quartz and pyrites of the copper. "Believer in White Pine Pockets" need not fear for the future results of the district he is advocating, provided competent practical men, well versed in these formations, are consulted as to their peculiarities. The following diagram will illustrate how every mine in the Chilian stratified limestone formations, especially in the district of Chanarcillo (where there are some 40 mines on the *same* lode), were similarly affected by the adjacent stratified and unstratified rocks, and at the *same* depths all thoughout.

Transverse Section of the Chanarcillo District.

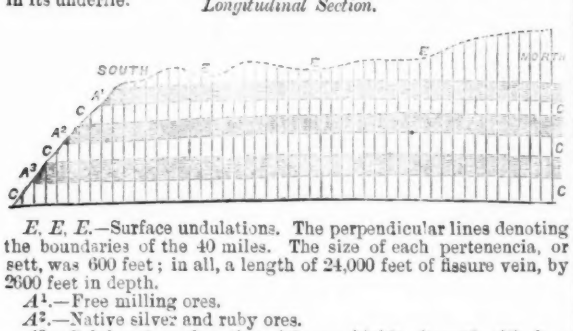


[The different bands of rock of this hill averaged each about 300 feet in thickness, and the aggregate depth of all together 2600 feet.]

A^1, A^2, A^3.—Three different periods of *stratification*, where the lode averaged from 4 to 8 ft. in width, with great productiveness through every mine. These periods vary from 200 to 300 ft. in perpendicular thickness.

C, C, C.—Three periods in *unstratified*, compact, hard rock, same thickness as above; unproductive, to even traces, throughout all the mines, and pinched to from 1 inch to ½ inch. A remarkable fact throughout, to a depth of nearly 2600 feet, was that the fissure, when reduced even to a minimum thickness, varied hardly 3° throughout in its underlie.

Longitudinal Section.



E, E, E.—Surface undulations. The perpendicular lines denoting the boundaries of the 40 miles. The size of each pertenencia, or sett, was 600 feet; in all, a length of 24,000 feet of fissure vein, by 2600 feet in depth.

A^1.—Free milling ores.

A^2.—Native silver and ruby ores.

A^3.—Sulphurets and antimonial ores, highly charged with iron pyrites.

HENRY SEWELL, M.E., F.R.G.S.

Salt Lake City, June, 1877.

THE CAPE COPPER MINES.

SIR,—Thanks to the admirable management of this company, the efforts of the "bears" to depress the shares have again been defeated. The management might well have postponed the announcement of a 20s. dividend another week, but in the interest of the shareholders (alarmed at the falling price) the directors wisely lost no time in declaring it. The low price of copper certainly seemed to warrant some decline in the value of their property, but shareholders ought to be aware that in this company a decline in the value of copper can always be met either by drawing on the heaps of reserve ores, or increasing the production from the stopes. We have also yet to see when the accounts for 1876 come before us what very large reductions have been made in the mine costs, in freight and transport to the coast, for it was only from January, 1876, that the full length of the railway came into operation. In 1875, mine cost, transport, freight, and charges came to about 16*l.* per ton. I think we may safely say that in 1877 we shall see these costs reduced to about 13*l.*, and it is possible that the reduction will not stop there, as 13*l.* is a good deal for bringing a ton of ore from the Cape. On the whole, the Cape Mines have no rival as a sound, mining investment, and there is no better 10 per cent. stock in the market.—*London, June* 7. A CAPE MERCHANT.

OUR MINING PROSPECTS.

SIR,—A few weeks ago you allowed me the favour of inserting a letter in the Journal on our "Commercial Prospects," treating of them more especially as bearing upon mining. Permit a short notice in your next issue upon what appears to me to be the prospects of the mining interest more directly. Short as the time has been since the appearance of my last letter, the views expressed by me have received confirmation. There is nothing to be apprehended from the depreciation in the value of metals from scarcity of corn, as the weather all over the United Kingdom and in France has undergone a beneficial change. The cold east winds which were parching the soil about the young wheat have given place to more genial breezes and much rain, followed by ripening sunshine, all of which were required to moisten the soil and nourish the corn fields, and the farmers are well pleased. From all quarters good accounts of our grain prospects arrive, and in a couple of months the fields in Southern Europe and in Africa will be ready for the sickle. In another month our own hay harvest will be ready for the scythe, enabling us to gather stores of provender for our cattle, which will be favourable to our markets for beef, cheese, and milk, so important to Englishmen. "Cargoes of corn on board" are announced to a large extent, and, viewing all things, there is even less probability than there was a few weeks ago that "dear food would cause cheap metals," as so many apprehended. There are now better indications than there were a fortnight, or even a week, ago of a good trade in various metals, and there is much reason for investors in mines to be up and doing, and for capitalists to come forward in time before prices advance, and secure under skilful counsel shares in good dividend mines, and also in progressive mines that are obviously advancing to the dividend catalogue. I can point out excellent mines in each category to any gentleman who will honour me with a call or a letter.

Lead mines are engaging attention, and there is every certainty that this class of investments is likely to pay better than ever. Wales and the Isle of Man are gaining still greater notice for the production of this metal, although the greater portion of what we raise is taken from the mines in England, which are situated in Yorkshire, Durham, Cumberland, Shropshire, Cornwall, and less productively in Derbyshire. It is likely that our ore for this metal will be raised at less cost as improved machinery, more skilful operations, and cheaper fuel are brought to bear upon production, and preparations are making in various directions for smelting the ores where they are raised. In Ireland it is reported that the metal abounds, and lies nearer the surface than in Great Britain; yet Ireland does not send 2000 tons of ore per year to market. It is also to be kept steadily in view that we do not take up sufficient for our own consumption, and Russia, Turkey, China, and the United States are likely to be better buyers than for some time past. The war is already upon the waste in this metal, of which it is productive, and as it extends, and the area of conflict enlarges, the present consumption will be doubled, and even trebled. Connected with the profits of lead mining the acquisition of silver must not be overlooked; Cardiganshire, Flint, and Montgomery yield a large proportion, and the Irish lead deposits are stated to be rich in it. To about 80,000 tons of lead ore last year the proportion was nearly 8000 ozs. of silver.

The war is also influencing the stocks of copper in Russia, Germany, and France. A contemporary recently stated that lead is more used for purposes of war than any other metal, but steel and iron and copper and its concomitant brass are equally required, especially since arms of precision have taken the place of the weapons formerly weilded. Copper for cartridges, and brass for accoutriments, are more in request than ever for both naval and military purposes. Cornwall, Devon, and Wales offer good opportunities of investments in mines for this metal, and this is "the nick of time" for investors to come in before more extended war causes prices to rise.

The tin trade has now for a long time been depressed, but quotations lately have been more favourable. This has been attributed by some to purchases to cover "bear" accounts, by others to the insurgent conduct of the miners for the Dutch Company in the great Eastern Archipelago, and by others to some intelligence from Australia favourable to the stock holders in this market, who have now considerable quantities of foreign tin. But here again the war brings in an element of calculation. Armies and fleets are now better provisioned than ever. It is said that the Russian army is excellently provided with tea and tinned beef, and the Turkish fleet with coffee and tinned mutton. It is at last well understood that armies and fleets must have good fresh generous diet, and tin is the metal in which they are chiefly carried and distributed. At present, however, the uncertainty as to whether our Government will not join in the war checks business, as uncertainty hurts trade more than a positive disadvantage which can be measured. If this uncertainty pass away business in metals will become more active, and in prospect of it investors should be more active now.

Bishopsgate-street Within, London, June 6. J. B. REYNOLDS.

OUR HOME INVESTMENTS—BANKS AND MINES.

SIR,—That joint-stock banks are trading concerns there can be no doubt, that profitable trading companies should command a market premium is beyond question, and further, that the prestige of past successes should command confidence in the future administration of affairs is likewise certain, hence joint-stock banking has become a recognised security and a favourite investment of the day. But joint-stock banking may be estimated too highly. It requires no great genius to establish a banking business, provided only that it be judiciously and carefully managed, nor any extraordinary endowments to conduct it to the highest principles of success. Talent, capacity, and aptitude are certainly essential, but prudence, self-denying zeal, and integrity are in general far more valuable and requisite. All these qualities appear to have been most conspicuous in the tact and policy of the directors and managers of the great metropolitan and most of the provincial banking institutions. The London and Westminster was started in the year 1834; the London and County and the London Joint-Stock in the year 1836, and the Union three years later. These four banking institutions stand at the head of all the London firms; still the liability of shareholders is unlimited, and in case of disaster every proprietor risks his all. It must be remembered that the paid-up capital of these four banks is simply 6,095,000*l.*, which bears in no respect a comparison with the commitments and liabilities of these gigantic institutions, while experience clearly establishes the fact that a portfolio of bills is only a second-rate security at the best; and in days of commercial pressure or panic scarcely a fourth or fifth rate one. Again, a very large portion of this paid-up capital is locked up in the magnificent buildings wherein their multitudinous transactions are conducted, as witness Lombard-street, Lothbury, and Princess-street. These, without reference to the costly branches, show plainly that in case of pressure the assets require time and sacrifice to realise.

The success that unquestionably attended joint-stock banking from its first introduction into this country indicated rapid growth and wide-spread public recognition, with cheering prospects of permanent prosperity, whenever the rules and principles of sound finance were observed. But it requires no great foresight to detect the inroads made through the fierce competition and rivalry of contesting houses for supremacy in the conduct of the finance of the country upon the sound principles of safe banking recognised by our forefathers, and which in olden times ruled the actions and conduct of bankers. Joint-stock banks are now simply trading discount concerns—gigantic pawnbrokers—and their businesses involve all the risks formerly vested in our merchants, manufacturers, tradesmen, and financiers combined. It appears to us, however, that joint-stock banking business and banking risks are still very imperfectly understood by the investing public; notwithstanding the revelations of the past, especially the years 1866-7, and the direful attendants on the collapse of so many establishments, the public appear still to regard banking shares as a security equal to our best railways and Indian stocks, colonial Government bonds, municipal debentures—to say nought of our home industrial undertakings and enterprises. There is a time when joint-stock banks will receive a fearful, if not fatal, check. Who can predict the future of the existing war between Russia and Turkey, the early approach of a general financial collapse, and the necessity for the Bank of England and such private banking firms as Glyn, Barclay, Smith, Payne, Barnard, and others taking in money on deposit, and allowing interest thereon. Such an event is quite within the range of probability, rather than submit to another suspension of the Bank Act, to float over the joint-stock banks of the country, and in the event of such a catastrophe to joint-stock banking it is easy to predict the issue—an immediate and irrecoverable suspension. Hence we say that eight to ten years' purchase of dividends is high enough for investors to pay for shares in even the best of joint-stock banks, for they are each and all simply trading speculative concerns, and those now at the front of affairs, and apparently, to superficial observers, unassailable, may possibly prove the weakest.

We direct the attention of the investing public to industrial and sound home undertakings, which embody the true elements of prospective security, with expansion combined. These concerns augment the trade and healthy commerce of the nation, employ the labouring classes, feed the masses, add to the social and material prosperity of the whole community, and enrich all. We at first, and on this occasion, restrict our remarks to a few substantial dividend and progressive British mines.

The Van Mine has obtained a depth of 105 fms., and is still highly productive and profitable. The monthly yield is 500 tons of lead ore and about 100 tons of blende ore. These products enabled the directors to declare three 16s. and one 18s. dividends for the past year, and another of 16s. was paid in March last. The present company was established eight years ago, and upon a capital of 63,750*l.*, profits of 320,625*l.* have resulted, averaging 40,000*l.* annually. The market value is 35*l.* per share—say, 525,000*l.* for the entirety. The present rate of dividend is 45,000*l.* annually, or about 70 per cent. on the capital, and over 8¾ per cent. on the selling price. The Leadhills Mine consists of 20,000 shares of 6*l.* each fully paid-up. The operations were first commenced by the present company in July last. The yield of the various points of operation are estimated at 30 cwts. up to 3 tons, 5 tons, 7 tons, 9 tons, 12 tons, and 14 tons of lead ore per fathom. During the period up to February last the yield was 1735 tons of lead ore, and the gross expenditure in labour, merchandise, machinery, and royalties was only 13,989*l.* 15s. 7d. The directors declared a dividend in April of 10 per cent. for the first six months, while the yield for the current six months is estimated at about 275 to 300 tons per month; this product will leave profits of 8000*l.* to 9000*l.* for the six months, equal to 12¾ and possibly 15 per cent. for the year. There are no less than 30 distinct well defined and highly mineralised veins in the company's concession, of which only four are at present wrought to any extent. The development of the Van up to 45,000*l.* a-year profit during the first eight years operations must be admitted as a wonderful work of practical skill, experience, and application, and yet there is conclusive evidence of like results being achieved at the Leadhills; in fact, Capt. Waters, as manager, raised the Roman Gravels and the Tankerville Mines to their present exalted position, and it must be admitted that he possesses all the essential elements with numerous lodes, and an area of 25 geographical square miles at Leadhills to exercise his skill and practical knowledge on. The mines are already a brilliant success, although the workings are comparatively in their infancy. The present company has a surface area large enough for 10 or 15 mines, but it will scarcely be fair to the present shareholders if the development of the whole 30 lodes be paid for out of the four now yielding gains of 1250*l.* to 1500*l.* monthly. This, however, is a question for future consideration, and, no doubt, in due course the directors will submit their plans to the proprietary.

Many lead mines in the North of England, Isle of Man, as well as North and South Wales, are remarkable for their large gains, with comparatively small capitals. The Lisburne, Cwmystwith, and Goginan are instances of great success in Cardiganshire within my own experience, and Montgomery has also given us a Van and a Dyliffe. The latter is now worked by a London company, and has declared a first dividend of 2s. 6d. a share. Messrs. Cobden and Bright were formerly the chief proprietors, and report states the gains at 100,000*l.* Great Laxey pays 7500*l.* quarterly, or 30,000*l.* annually—50 per cent. The present company has netted 324,750*l.*, and sells at 10 years purchase. The workings are down to the 235 fathom level. The directors are practical miners, as well as of recognised commercial standing, and long before the formation of the present company in 1862 large returns and profits resulted. Minera is still an important property, though the profits have greatly fallen off. Tankerville is materially improved in the bottom of the mine. The sales of ore were formerly 150 tons a month, and the dividends regularly paid quarterly. The sales, however, receded to 100 tons monthly, and no dividend has been declared since November last. The next monthly sale will be 125 tons, and the gains upon this quantity will admit of a resumption of dividends of 3s. to 3s. 6d. quarterly. At the 170 the ore ground has considerably lengthened, while the lode at the 180 is valued at 3 tons to the fathom westward, in which direction a long course of ore exists in the level above, while the 180 end eastward is valued at 6 tons, thus showing the enhanced importance of opening out ground in that direction. The shaft is sunk 12 fms. deeper, and a short cross-cut will be extended to the lode at the 192. Should this point only equal the 180, and realise the predictions of experts, a long run of valuable ore in increasing length as depth is attained will become rapidly developed from the 192 up to the 170 fm. levels. Hence there is every prospect of the sales soon returning to the normal standard of 150 tons monthly, and the dividends augmenting to 5s. and even 6s. 6d. a share quarterly. The shares are now quoted 7½, but have a decided upward tendency. Once selling at 20*l.* per share.

Monydd Gorddu: This lead mine in Cardiganshire standing west of Haffon Henfwlch, has from time to time attracted considerable attention in well-informed mining circles, but probably never so deservedly so as at the present time. It must be remembered that the Crown received in former times, from reference to official records, no less a sum than 1,400,000*l.* in royalties from the Haffon Henfwlch, while the lode westward in Monydd Gorddu is all but unwrought; in fact, the deepest operations extend only 36 fms. below the surface. The ores made up close to the surface, and attracted great notice about three years ago, and a company was formed a year later and drained the outcrop to a depth of 12 fms. by an adit level. A perpendicular shaft was started to a depth of 45 fms., but in anticipation of this result a cross-cut has been extended north to intersect the lode at the 24 fm. level. Here the vein has proved a success, and can only be compared with the Haffon Henfwlch, which returned millions worth of silver-lead ores of a high percentage. We have ourselves seen some of the product from the new discovery, and the characteristics are all that can be desired, and similar to those associated with large and profitable deposits of mineral ores. A junction of two lodes occurred just above the 24, hence the primary cause of the rich deposit just commenced to be developed. A few weeks will shed great light upon the future. The five fathoms already opened has been of the value of 40*l.*, 60*l.*, up to 80*l.* and 100*l.* per fathom. From the back of this lode, and from the surface discovery above referred to, some 100 tons of lead ore have been sold for about 1800*l.* The machinery is ample, and the future development will prove economical and certainly rapid. The shares are 11,000 of 5*l.* each, and we have great pleasure in directing attention to the concern as a probable great and early prize.

R. TREDINNICK,
81, *Bishopsgate-street Within, June* 5. Dealer in Stocks and Shares.

THE MINING INSTITUTE OF CORNWALL.

SIR,—I was greatly interested in perusing Mr. A. J. Campbell's paper on the "Use of Stone-Breaking Machines in Cornish Mines." Fourteen years or more have passed since the stone-breaker was introduced to the mining public, and now our Rip Van Winkles are becoming alive to its value. We want, however, a lot of information on a variety of subjects, such as the following, which might form special studies for the A. R. S. M. of Jermyn-street:—"On the best form of a vanning-shovel and the shovel-hilt; on the application of the principle of the blow-pipe to the reduction of ores; on the tributers' use of the microscope for discerning ores in the greenstones and elvans of Cornwall; on the scientific application of the dowsing-rod for effecting the discovery of lodes and determining the character of rocks adjacent thereto; on the advantages of dispensing with sizing and classification of grains in the dressing of crusher work; some reasons why rock-drills are successful in American and English mines, and why they cannot be successful under Cornish management unless the agents are honoured with "bal shammock; remarks on the value of pick and gad knowledge, and the worthlessness of accurate and well-arranged statements in connection in mining." You will admit, Mr. Editor, that a series of papers running under such headings would if carefully written be highly interesting and of immense service to the members of my family, who are not only vain and proud of each other, but who adore their relative— COUSIN JACK.

THE TWO SISTERS.

SIR,—I am glad to see Tankerville has improved already; 25 tons on the month. Perhaps if her friends watch her narrowly she will recover her propriety sooner than was expected. It is clear while no management can make a mine produce more than it really contains some management may make it produce less.

Messrs. Watson Brothers inform us in last week's Journal that the monthly cost of Tankerville, including dues, is about 1150*l.*; that the sale of ore, even at 100 tons per month, realises about 1412*l.* Lead is firm, and likely to continue so; there was, therefore, a clear profit of about 262*l.* a month. I have never known Tankerville reported at more than 150 tons a month. But while there yet remain two-thirds of our profits there also remains no part of our dividend. I am a simple fellow, but does this indicate good management? Especially when one-half the remaining third of our profits has been recovered in a month. No wonder Miss Tankerville has tumbled down indelicately to 6½. For my part, simple as I am, I would rather have two-thirds of my dividend than none at all.

Roman Gravels we were told at its annual meeting was a great mine, which we were only just beginning to work; and its tender-hearted captain, who also steers Tankerville upon a kind of twin-boat system, made a touching allusion to our posterity, our children's children, which almost made me weep. But Roman Gravels threatens to fall as deeply as her sister, or at least she has got as low as 10½, and may get gravelled altogether. Is there any fair cause for this? Was it judicious to choose so eccentric a period as the four-monthly for the payment of dividends? Was it judicious to postpone more than once the payments due at that time? Has the management been justified in the course it lately pursued as regards the Burry Port failure?—that is, assuming all the statements the management has made about the prosperous condition of their mine to be true.

I venture to say that if the statements put before the shareholders and the public were true (and I for one believe they were) then the present position of these mines before the public is very far from being satisfactory. I believe the correct thing is to say that Roman Gravels and Tankerville are flat. But unless the shareholders de-

mand the reason why, they will prove themselves flatter than the mines. At least so it seems to— A COUNTRY COUSIN.
June 6.

COPPER MINING IN NORTH WALES.

SIR,—It is now expected there is a lively time ahead; a gentleman of South Staffordshire has been down here with a party who have inspected, and it is said purchased a very valuable copper mine, of which it has been stated by some very competent engineers, who were down for the purpose of making a survey, that at least 1000 tons of good marketable ore will be raised, dressed, and sent to market monthly when the mine is fully opened and worked properly with vigour. This is no new discovery, it was started about 20 years ago. The lode runs north and south, and is said to be a continuation of the Great Ormshead lode. The gentleman who took the lease of the mine, it is said, paid 40,000*l.* down, and agreed to pay a royalty of 1-12th part of the cash for which they sold the copper and lead, but before they had well made a scratch on the top of the lode they fell out, and, like unwise men, went to Chancery, and before the case could be settled one of them died, then other difficulties presented themselves, which caused delay. Next the lessor died, and the estate was sold by auction. Little, if anything, was known about this mine by those who attended the sale, and the surviving lessee purchased the estate; he is now dead, the property has fallen to his son, who, it is said, has sold it for a very large sum. This district is now expecting to see it opened and worked properly with spirit and determination. The lode has been opened at one point only (although it runs about a mile on the estate), at which place it has become wider and wider, and the ore improving as they have gone down. Mr. Morris, the captain, told the writer that he expects to meet with a very large deposit of ore; he says the ground looks like it, and copper and lead at the bottom of the sump. The ore they have sent to market has been most favourably reported on. They have neither engine nor water-wheel fixed to dress ore, all they have sent has been dressed by hand. I have been told that but very little capital will be required to work it, as there is no difficulty to contend with as at some places, and the returns, it is reported, may be made the first month. Mr. Free, solicitor, 14, Temple-row, Birmingham, I am told is engaged for the purchaser. A. B. C.
Conway, June 6.

MINING IN NORTH DEVON.

SIR,—From information I have just had I think it is likely that mining will soon be carried on extensively in this district, which gives me pleasure to communicate, as it has for some time been much neglected. By the recent valuable discoveries of silver-lead ore at Combmartin, and the large lodes of manganese at Wheal Comfort, Braunton, as well as the manganiferous iron ores in the adjoining parish—Georgeham—will give it a great stimulus, as each ore is of rich quality, and the indications are favourable for producing large deposits, which is likely to bring it into the repute that I have for some time considered it will soon become—a great mining centre.—*Ilfracombe, June* 6. TOURIST.

CAPT. TREGAY, AND PEDN-AN-DREA MINE.

SIR,—It must be rather amusing to the readers of the correspondence which has appeared in the Journal on this subject to see the way Capt. Tregay tries to shuffle and back out of the Pedn-an-drea affair. His letter of last Saturday regarding West Chiverton Mine is simply absurd. What on earth has the unfortunate failure of two lead smelting companies to do with the executive of the mine, or the profits to be made by regular monthly sales of ore, and from which good dividends have been paid? If he will again look at the accounts—which I advise him to carefully study—he will there find that a month's cost was paid, although not charged, so that he is quite in error in saying there were more than two months' cost totally unprovided for. No matter what Capt. Tregay may say, the mine is paying, and that without any interference on his part. These facts speak for themselves, and I feel sure that whatever is stated by the manager he will be able to carry out, as he has hitherto done, to the satisfaction of all the shareholders; therefore, let Capt. Tregay wait (that is, if he can allow himself) till the next meeting, when no doubt the supposed 7000*l.* to be provided, independent of four months' cost, will have vanished, and his dream of figures have fortunately proved not to be a fact.

The other matters regarding West Chiverton which Capt. Tregay refers to I consider beneath my notice, and decline to reply, having made up my mind not to enter into any fresh discussion with him until he has honestly settled the Pedn-an-drea question. Captain Tregay's position must indeed be a "bed of roses," as he very innocently says—"I am perfectly satisfied with Pedn-an-drea." But do the late shareholders feel in such a happy frame of mind? Let Capt. Tregay justify his position by answering to the satisfaction of the late shareholders the questions put not only by myself, but by "W. X.," in last week's Journal:—"How is it that under Capt. Tregay's management for the late company, with a much higher price for tin, the shareholders lost 65,000*l.* out of their pockets, and the same manager can, almost immediately after he becomes the sole proprietor, make a good profit in working the mine himself, even with considerably lower prices for the returns?"

The above question embraces the whole gist of the argument, and if Capt. Tregay will simply confine his remarks to it, and not go rambling about for some excuse or other to evade the subject, he would save himself a great deal of unnecessary trouble, and, if possible, clear his present position with the late unfortunate and disappointed shareholders. GRANVILLE SHARP.
Gresham Buildings, Basinghall-street, June 4.

CAPT. TREGAY, AND PEDN-AN-DREA MINES.

SIR,—Is not "W. X.'s" cool effrontery becoming simply ridiculous? He has been driven, one after another, from his assumed positions, and his last letter is a virtual acknowledgement of that fact. In his last letter but two he was positive about the 100,000*l.*, in his last he has fallen back upon the 65,000*l.*, with as much assurance as if he had won a victory. This after "W. X.'s" vague hints about official balance-sheets and mysterious stores of hidden information is simply ludicious. However "W. X.," not contend with appearing absurd, must needs pretend to be magnaminous, and now proclaims that he never attacked anyone, especially Capt. Tregay. No! "W. X." is a species of commercial Wilberforce, a modern Howard, who, animated by no feelings of self-interest, glories in decrying for the public weal all enterprises in which he has no share. I have no doubt the scorpion considers itself not only an inoffensive but actually an amiable animal, and wonders that those whom it would bite should take the pains to crush it.

Let us now consider "W. X.'s" last position. He says, "The average monthly cost in the last year was 1850*l.*, though Capt. Tregay had announced considerable reduction in the expenditure." We find that the company closed its connection with the mines on Aug. 4, 1876, therefore the last year of its expenditure would run from Aug. 4, 1875. Now, Captain Tregay made the announcement referred to on March 16, 1876, about four and a half months before the company shut up, and yet "W. X." seems now to think that 12 months' cost should have been affected by this announcement. We know, and the shareholders know, that a heavy expenditure had been going on previous to February, 1876, in carrying out certain work not connected with immediate returns of tin, but rather quite to the future advantage and benefit of the mines, so that it is clearly absurd to go back to August, 1875, to judge of a reduction announced in March, 1876. This is, however, quite as reasonable as "W. X.'s" other criticisms on the subject. Your readers can readily judge of the amount of truth existing in "W. X.'s" compositions by comparing his assumed costs and the reality. "W. X." says the cost was 1850*l.* per month, while on reference to the printed balance-sheets we find that issued March, 1876, brought down the costs to February 18, so that the one which was issued in August accounted for 5½ months' labour and six months' merchants' bills, and for the whole of that time it states that the costs from last account to date were 9066*l.* 1s. 10d., which would be nearly 1621*l.* 2s. 2d. per month, instead of 1850*l.*, as "W. X." assumes. Here goes another 12 per cent. from "W. X.'s" calculation. Who is the principal dealer in fiction after that? Let us see. There was 35 per cent. of error in "W. X.'s" positive statement about the loss of the mine during Capt. Tregay's management, and now we have 12 per cent. more, making a grand total miscarriage of veracity on the part of "W. X.," the financial Solon of this generation, of 47 per cent. We shall now no longer sigh "Oh that mine enemy would keep a book," but rather pray that he may damn himself by publishing his accounts. Is it not time that "W. X." should admit that he really does not understand what he is writing about? ARGUS.
June 7.

PEDN-AN-DREA CONSOLS.

SIR,—The correspondents to the Journal who are envious at the prosperity of Capt. Tregay in Pedn-an-drea will never be satisfied I believe till that Captain and fortunate proprietor of those mines makes them a handsome *douceur*. They must be very ignorant indeed if they really suppose that in mining the condition of the lodes never changes. Lodes of all sorts are subject to frequent changes; one day rich, and the next sometimes poor. The difference in the returns at Pedn-an-drea is entirely owing—as I have been informed—to a favourable change in the lode since the purchase by Captain Tregay. I have no interest in the mine, nor do I think that Capt. Tregay requires any assistance in defending his reputation, being well able to defend himself, but he is not obliged to answer all the questions proposed by disinterested persons. If Capt. Tregay were of my mind he would let the writers go on venting their spite, and only strike at them when a legal opportunity occurs—which may occur.—*Hotel, Hayle, June* 4. TOURIST.

PARYS MOUNTAIN COPPER MINES.

SIR,—I have noticed in the *Mining Journal* of last week some enquiries by "An Engineer," who says that he is greatly interested in mining properties in this locality, and asks for further information concerning these mines. It is a well-known fact that the Parys Mountain Mines were once celebrated for their productiveness, inasmuch as they formerly stood first and foremost, and for many years ruled the copper standard. These mines for a long period have been wrought by private companies, and untold wealth has been realised from the great opencast (or quarry excavation), extending over 600 yards in length, 200 yards broad, and 55 fathoms in depth. It is towards this vast chasm the 90 cross-cut is being driven, which will come in 35 fathoms below the old workings, where large masses of copper ore are again expected to be met with. This cross-cut is now approaching near the intermediate lodes running parallel with, and in close proximity to, the great quarry, and may at any time strike into a large body of ore. These intermediate lodes have also been very productive above the 45 fm. level. In reply to "Engineer's" enquiries, I beg to state that the strong coppery water issuing from the 90 cross-cut is being followed up as the forebreast advances; and we have every reason to believe that this claret-coloured coppery water is coming from large deposits of mineral not far ahead. I have been connected with these mines for many years, and have always observed that when strong coppery water has been found coming from the rock it has been a favourable indication, and a pretty safe guide for leading into bunches of ore. In concluding my remarks, I may add that from the present encouraging prospects there is every probability that these mines will again ere long rank with the best copper mines of the day.
Parys Mountain Mines, June 5. T. MITCHELL.

PARYS MOUNTAIN MINE.

SIR,—I notice in the 90 cross-cut, driving south under the quarry, that two more branches or veins have been intersected, thus giving further testimony of the existence of a large body of copper ore at hand. To the expected strike of ore in this drivage all practical mining men are directing their attention, as the rise in the value of these shares would be represented by pounds and not by shillings merely. A speculation of no ordinary character here exists. The character in the 90 cross-cut is also changing, being more mixed with quartz, and it is not unreasonable to expect an early success; indeed, it may be looked upon as almost a certainty, which, as this drivage advances, may any hour verify. The 80 east is looking very favourable and improving, and a large extension of good ore ground is added to the mine for stoping, thus increasing the future returns. It seems almost impossible to realise that five millions sterling were netted in profits from this very hill, and yet it is recorded without doubt. The indications apparently prognosticate a second sudden great accession of wealth, the rich dark stream of water coming from this portion of the mine being full of coppery deposits, and tends to prove that a mass of ore remains to the present holders of shares in this mine. MINE AGENT.
June 4.

ROMAN GRAVELS MINE, AND ITS MANAGEMENT.

SIR,—Referring to the letter of a "Shareholder in Roman Gravels," which appeared in the Journal of May 19, and also to the communication of "A Country Cousin" in that of May 26, I would remark that they both seem to have overlooked the letter from me which you kindly inserted several weeks ago, and in which I brought under notice several points in connection with the management of which the shareholders have good reason to complain. "Shareholder," in referring to the irregular payment of dividends, speaks as if they ought to have been declared every four months. He seems to be unaware of the fact that Roman Gravels was started with the intention of declaring dividends quarterly, and that dividends were so paid regularly until the directors raised the division to 8s 6d. per share, which was then continued for one year, and has since been paid at irregular intervals of four, five, and seven months. To enable the present shareholders, who have only lately purchased, to judge of the injustice done to those who became shareholders some years ago, I ask them carefully to consider the following extracts from speeches delivered at the annual meeting held on April 29, 1874:—

"The Chairman (Robert Wilson) said the directors had much pleasure in meeting the shareholders at this, the fourth, ordinary general meeting of the company, and to congratulate them upon the increased prosperity of the mine, as shown by the balance-sheet and the report of Captain Waters. It would seem that the profit during the past twelve months had been 23,599*l.* 7s. 4d., out of which the directors had declared dividends to the amount of 20,407*l.* 10s., carried 300*l.* to reserve, leaving an increased balance of 551*l.* 17s. 4d. as compared with last year. When on the mine at the commencement of the present month he was much pleased with the extraordinary progress that had been made in the surface improvements and extensions since his last visit to the property; indeed, everything now was nearly complete for dressing a very much larger quantity of ore than was at present returned. Capt. Waters would tell them he would be able soon to considerably increase the returns. The price of lead had somewhat declined, but notwithstanding this, no doubt whatever need be entertained that equal, if not better, results would be realised during the current twelve months than had been the case in the period embraced in the accounts now before the meeting."

In reply to Mr. Geach, Capt. Waters said—

"He had gone into that matter (increasing the returns) with the board at the meeting just concluded, and it had been decided that the returns should not be increased until August: not that they could not commence at once but because it would be more cheaply done by-and-bye. In hard ground and a wide vein large rocks of stuff were thrown down, and unless they got the stuff under the men's feet to work on the cost of working would be much more expensive. By-and-bye they would be able to have a much larger quantity of stuff, and still keep a larger quantity in reserve under their feet, and thus avoid the expense of timbering. But in August the returns would not be increased by a paltry 20 tons per month but to the even figures mentioned in his report (300 tons), the plant and machinery being fully equal to the return of 300 tons per month."

This is very plain and intelligible language. The sequel is well known—instead of increasing their returns in 1874 from 230 to 300 tons they reduced them 30 tons in the following year, and the sales instead of occurring monthly took place at irregular intervals, and up to the present moment neither manager nor directors have ever given anything like a satisfactory explanation why such a clear and definite promise has not been fulfilled. A surer method could not have been adopted for destroying confidence both in the mine and the management. I for one implicitly believed the statements, and bought shares on the faith of them, and now I observe they are selling at a little over 10*l.* per share.

I notice that you make a remark in last week's Journal that shareholders in common fairness should attach their signatures to such communications as this. I have special reasons for not wishing my name to appear publicly in the Journal, but none whatever why my name should be withheld from the directors, although I would have considered it sufficient for them to know that I am a shareholder, and that I last year addressed a letter to the Chairman bringing the above matters under his notice, and requesting an explanation to be given at the then approaching meeting, but no notice whatever was taken of my letter. I trust, therefore, you will have the kindness to publish this.
June 6. A SHAREHOLDER OF SOME YEARS STANDING.

ROMAN GRAVELS MINING COMPANY.

SIR,—You have published several letters lately from shareholders complaining of the management of the Roman Gravels Mining Company. As writing letters to the *Mining Journal* may not be sufficient alone to produce a reform, let me ask all those shareholders, both in town and country, who are dissatisfied with the present state of affairs to attend the next meeting—which, by-the-bye, ought to have been called before this time—and support with their voices and votes some proposals which will then be made to place the financial position of the mine on a more satisfactory footing.
Market Harborough, June 5. W. H. GATTY.

CARN BREA MINES.

SIR,—Can any of your readers, excepting the purser, inform me what is the amount of the liabilities against these mines? Is it true that four months' costs are in arrear, and that the tin sales were credited up to the day of the last meeting? It has been intimated to me that the outstanding debts are heavy. Before I purchase any shares in the mines I should like to be satisfied on these points, that I may not be taken in like I was at another mine in Cornwall, where I bought some shares at 6*l.* each believing that the costs were all charged, but I soon found that there was a debt of 20,000*l.*, and I had to pay nearly 50*l.* on my shares in the winding up, and lost all the purchase money besides. SPECULATOR.
Old Broad-street, June 2.

CLEMENTINA—D'ERESBY.

SIR,—Having visited Clementina and D'Eresby Mines, I can fully agree with all that Mr. Watson has said in his letter. Clementina is really a wonderful mine, and will shortly make large returns. There is a quantity of rich ore, nearly pure galena, at surface ready for dressing. I congratulate my fellow-shareholders on the value of their property, which we have got at such a nominal price. It is one of the few mines brought out with a small capital. Great credit is also due to Capt. Bennetts for the energetic manner in which he is developing the mine. SHAREHOLDER.
West Bromwich, June 7.

CORNISH MINING.

SIR,—We have to look forward for the future success of the county to the development of new or unwrought ground. That its undeveloped resources are enormous no one can for a moment doubt. The late depression, brought about by a variety of circumstances, has caused this branch of enterprise to be sadly neglected. There are some mines, however, which have so far weathered the storm as to enable one to speak with confidence of the result of a few months further perseverance, unmistakeable evidences presenting themselves of the near approach to copper ore deposits. All through the Gwennap district (which is the richest in the county) the mines of the greatest value commenced producing ore at about the 100 fm. level, proving more and more productive as depth was attained. This, then, is the present position of some mines known to the writer, who well remembers similar instances subsequent to the panic which existed some years since, when mining was so neglected that East Caradon shares sold at 2s. 6d. per share, and about six months after fetched freely 50*l.* each. Wheal Buller was once so neglected that the public would not buy the shares at any price, and in less than three months shares rose on a discovery to over 500*l.* each. More recently, Carn Brea shares were forced on the market at 9*l.* per share, and in less than four months went to 60*l.* per share; while Tresavean, in the year 1833, were scarcely saleable at 10*l.* per 100th share; afterwards, on a discovery, sold as high as 2000*l.* each. There are many other similar instances to which it is needless now to refer. Suffice it to say that if the whole of the outlay on a few shares were lost it would be of little moment, while the trifle risked has in a great many cases led on to fortune. Such, then, is the present analogous position of some few mines in the county, and I venture to assert that the present year will see like results from some now selling on the market at a ridiculously low price. This opinion is justified by analogy, to which practically scientific authorities will ever attach great importance, having proved to be the safest guide in forming their opinions of the inherent value of mineral properties.
St. Day, Scorrier, June 7. CHAS. BAWDEN.

NEW CONSOLS.

SIR,—I am one of the unfortunate workmen in New Consols, which I find is being wound up. I am a poor man, and want to be paid. Will some one of your readers be so good as to inform me whether the labour cost will be paid in full (if the assets are sufficient) before the other creditors? If the labourers are to come in as other creditors I suppose they will never be paid in full, because the whole amount due is beyond the value of the property in the mine, unless the purchasers pay a prospective value for the mine as a "going concern."—*June* 5. A POOR MINER.

HOLMBUSH MINE.

SIR,—In reply to a letter which appeared in last week's Journal, and signed "Investigator," I have simply to say that I cannot regard anonymous attacks as either honest or disinterested, and the only criticisms which I shall answer must first be publicly avowed by their real authors. STEPHEN H. EMMENS.
Palmerston Buildings, June 8.

LANNER VALLEY.

SIR,—I did not expect that my few historic notes inserted in the Journal would have aroused the indignation of your correspondent John Lean. If he is wont to express himself so warmly with respect to all narratives of vice which are currently reported in the papers he must be an industrious man, and have an extensive field for labour. If, in giving statements of events which occurred long since, I am a servant of the Devil, he may regard the historians who have described the wickedness of deceased individuals as being in the same service, which, however, I dispute and deny. A man who wilfully writes falsehood is a servant or child of the devil, but a recorder of truth is not so, and in all I write I adhere, so far as I can, to truth, and write nothing from a spirit of hatred, envy, or malice. Mr. Lean admits the truth of my records, and I say what I have written can injure nobody. Therefore, I will add two more historical facts. About 50 years since there lived in Lanner Valley a gentleman—who recently quitted life's stage—who was the deputy purser of a mine in Gwennap. He was possessed of some property, but, being fond of company, and keeping much of it at his house, his ten guineas per month and his little property were insufficient to meet the expenditure. So he used a few hundreds of pounds of the money belonging to the company, which, when the fact transpired, was followed by his dismissal from his post. However, I believe his employers did not eventually lose any of the money so misapplied. Can Mr. John Lean guess the name of that individual? Close by the same valley there lived another gentleman of high connections, who occupied about the same time a similar situation in another mine in the parish, who had about eight guineas per month. He applied to his own use about 200*l.* of the money belonging to his masters. It was soon discovered, but the man was retained in his office for two reasons—first, there was the connection; second, by retaining the man's services, and by retaining also a moiety of his monthly salary, there was a probability of the repayment of the embezzled sum, and thereby, I believe, repayment was made, and the affair hushed up. That was what people call "making the best of a bad matter." Can Mr. Lean guess who that was? I don't wish him to give the name, although that individual, too, is off life's stage. I deem that mode of arrangement very much better than the too common practice of treating a man as a felon upon every mishap of that kind. I know a gentleman (he lives near me) who had a man servant who cheated him. When he found out the fraud he said to him, "John, you have cheated me; you must leave, but I have no wish to ruin your character by exposing the fraud. I will give you a chance to mend your ways. Never do wrong again. You may get another place, but be sure you don't refer to me for your character." The man left, with gratitude for such good nature, obtained a situation, behaved well in it, and after awhile came back to his former master and said, "I thank you, Sir, for your kindness to me; I have a good situation, and I will take good care to keep it. I will do wrong no more."

This reminds me of an anecdote of the late Lord Mansfield, who advertised for a

coachman. The advertisement was answered by a coachman who had been discharged for dishonesty. His lordship asked if he had a character to show. The man produced a letter which contained these words—"The bearer is a good coachman; I discharge him because he cheated me" "You will do," said his lordship, "I want a good coachman, and I will take care that you shall not cheat me." A man may also be good as a clerk, but not as a cashier.

It seems very odd that Mr. Lean, who pretends to so much good feeling for the posterity of the late Capt. W. Martin, should aggravate the "mischief" which he assumes my letter has done, for he has gone beyond *my* description. I did not go so far as to call him by the very unkind definition of "a sottish drunkard." I never called him so; I said that he was a "tippler," which is far less in its implication than Mr. Lean's definition. So that Mr. Lean's tenderness for the surviving relatives is obviously less than mine.

"For Satan finds some mischief still,
For wicked men to do." TOURIST.

Hotel, Redruth, June 6.

"THE OLD MEN."

SIR,—Nothing is more common amongst miners than a reference to "the old men" when they observe old burrows thrown up from the backs of lodes, which may be seen in most tin mining districts in Cornwall and Devon. By old men they mean ancient workers on lodes, or searchers after lodes. It is well known that the ancients in remote generations did a great deal in mining in both counties in opening up lodes and in operating on them so deep as their appliances for drainage enabled them to go, which was not far below the adits. They had not the advantage of the steam-engine, like the moderns have, for pumping, stamping, and winding. It has been said by some persons that the ancient miners discovered all the lodes at present known. I question the truth of that statement, and I should like your correspondents to inform your readers what lodes of tin and copper they know to have been of modern discovery not known to the ancients. Of lead lodes I presume they knew but little, if anything; they did not, for instance, discover East Wheal Rose lodes (four), which were rich in lead. But, go where you will in tin-bearing districts, you will find evidences of ancient works, except where they have been obliterated by modern operations. However sceptical some persons may be as to the efficacy of the divining rod, I am of opinion that by its use the "old men" discovered the lodes. As to tin streams, I am not aware of the existence of one tin stream where they did not pioneer.

Truro, June 1. R. SYMONS.

MINING IN CORNWALL AND DEVON.

The following lecture, on "The Exploitation of Tin, Copper, and Lead Ores in Cornwall and Devon," was, on Monday, delivered to the students of the Bristol Mining School, by Mr. J. H. COLLINS, F.G.S., hon. sec. to the Miners' Association of Cornwall and Devon:—

The metallic minerals of the West of England are almost entirely obtained from veins or lodes, and as it is important that every mining student should have correct ideas as to the nature of mineral lodes, I will commence my lecture with a few general remarks upon those of the district in question. The geological structure of the Cornwall mining district is, in its broad outlines, very simple. The principal features are indicated on the map. The fundamental rock is a mass of granite extending from Dartmoor to Land's End, a distance of 100 miles. It appears at the surface in five large and a number of smaller masses. On the granite rests the killas, a kind of clay-slate, locally so named, and this is traversed by numerous dykes of porphyry called elvans, by beds or intrusive sheets of many different kinds of rock called generally "greenstone," and by innumerable mineral veins. Those veins which contain metallic ores are called lodes; those filled with quartz, and which generally run in a north and south direction, are called cross-courses; those which are filled with clay are called flookans or slides. A group of these mineral veins is shown in the plan of Wheal Seton and neighbouring mines. The lodes of tin and copper occur both in the granite and the slate, but seldom more than 3 miles from the junctions of the two rocks. Lodes of lead and iron not only occur in similar situations, but also at considerable distances from such junctions. The same lodes may yield different minerals—as tin and copper, or copper and lead—either mingled together or at different points in depth or extension, as occurred, for example, at Wheal Seton. The same lode may be, and often is, worked simultaneously at different points by different companies or individuals, a bar of ground being left as a barrier or not, according to the circumstances. Without going into details as to the directions of the lodes in different parts of the district, I will simply say that most of the best tin and copper lodes have a direction not far from that of the main axis of the district—magnetic east and west, although there are some notable exceptions. The lodes are very rarely vertical; generally they dip or underlie a certain number of feet per fathom. The average dip of tin and copper lodes is 70° from the horizontal, sometimes northwards sometimes southwards, although in the same lodes very great variations occur in this respect; the variations in width are even greater. The average width, however, of the tin and copper lodes is less than 4 ft., the variations even in the same lode being from a mere line to 20, 30, or 40 ft., or even more; generally the lodes dipping towards the nearest mass of granite are richer than those dipping away from it; the more vertical parts of the lode are richer than the less vertical; the wider parts richer than the narrower; those enclosed in rocks of moderate hardness richer than those enclosed in very hard or very soft rocks. But to all these generalisations there are many exceptions, to which I cannot now further refer. I will only say that the form and situation of the rich parts have been recently studied from a mathematical point of view by Moissenet, of the Ecole des Mines, at Paris, in his "Studes sur les filous du Cornwall," which I hope to publish in the form of an English translation very shortly. The lodes in cross-section have a general resemblance to that of a very steep rearing bed of coal or ironstone, but this resemblance is extremely superficial. Beds of coal are at least approximately equal in thickness and value over areas of considerable extent. It is true they are frequently subject to disturbance from faults, but the lodes not less so—added to which, and to the long catalogue of irregularities to which I have just referred, it must be borne in mind that the lodes occupy fissures, which are themselves faults, in nearly every case, instead of being parallel to the beds of rock on either side. This extreme irregularity in the quantity, quality, and position of the mineral naturally leads to, and indeed necessitates, a less regular mode of laying out working than is generally adopted in coal mines, as will be seen from the more detailed description which I now propose to enter upon. Let me first say a few words as to the discovery of mineral veins. Boring is manifestly inadmissible in a majority of cases, since the bore-hole, even if it happened to pass through a rich part, might at the same time miss, the actual metallic masses, besides which, the chance of passing through a poor part would be very great. Obviously it is important to test the lode either in length or depth, or both, for many fathoms, and this can be done cheaper by driving levels, or by a combination of sinking and driving, than by putting down a sufficiently large number of bore-holes. I may say, however, that boring would often be a valuable mode of testing the extent of a rich part when discovered, and it deserves to be resorted to for this purpose oftener than it is. The mineral explorer looks for certain outward signs of mineral wealth, such as shodes, gossans, springs, stains, and the like. Shodes are stones of ore often more or less water-worn, which are recognised by the miner as being similar to those which occur in lodes. If he finds such stones he argues that they could only be brought by natural agencies down hill, and therefore goes upwards, searching as he goes, until such shodes are no longer to be found. At or near the point of disappearance he searches for the lode by costeaning, huishing, or in some equally effective manner. Gossan is the name given to the cellular quartz and ferruginous matter often found at the outcrop or back of a lode. It seems to arise from the decomposition of pyritous minerals. It arises from decomposition of pyrites, and indicates more especially the existence of ores of lead, copper, iron, silver, or gold beneath—lodes of tin only often have no gossan. This gossan is sometimes turned up by the plough or exposed by a running steam. Springs of water frequently indicate the back of a lode, and even in seasons when no water is visible a slight depression of the surface, a softness in the subsoil, or a superior greenness of the herbage often indicates their position with accuracy. Stains of various kinds often occur in connection with these springs.

The process of costeaning is as follows:—The general bearing of the lodes is often known, or may be inferred, from the general lie of the country; in Cornwall it is nearly east and west. Pits are sunk in the neighbourhood of the indications—(say) from 2 fms. to 20 fms. apart, and deep enough to reach below the disturbed subsoil or alluvial covering of the place. These pits are then connected by a deep trench or an underground level, by which means the lode is sure to be discovered. When the lode is found it may be driven upon in either direction, until the explorer is satisfied either of its barrenness, or that it is worthy of further exploration. Supposing the appearances to be favourable, if the ground is flat nothing further can be done without sinking a shaft and erecting some machinery for raising water from the workings. In many instances, however, it is possible to prove the lode at a moderate depth—from 5 to 50 fms.—by means of an adit level. If this adit level can be driven on the course of the lode, there is the great advantage of testing it over a considerable extent, but many adits are driven across the country—the shortest route, of course, being selected—these are called cross-cut adits. The cost of driving an adit will in general vary from 3*l.* to 10*l.* or 12*l.* per fathom, but occasionally, when very hard rocks have to be cut through, as much, indeed, as 50*l.* per fathom has to be paid. Of course, such a heavy cost would not be incurred in a mere speculative adit, unless indeed it was being driven to drain a district rather than a single mine. The finest example of an adit in Cornwall is that which drains the Gwennap mining district. It was driven more than a century ago; with its branches it is nearly 40 miles long, and it drains about 30 square miles of country to a depth varying from 30 to 90 fms. If the adit is very long, adit shafts will be required for ventilation, and in any case one or more shafts will be required for the proper working of the mine, even in cases where the mineral is brought out through the adit. These shafts are usually vertical for the first 20 to 40 fms.; after that they are generally sunk on the course of the lode, but at right angles to its bearing; a few, like the Boscawen shaft at Botallack Mine, follow the lode in depth and bearing also. The advantages of downright shafts are that they are sunk to any given depth at less cost and in less time, and that they afford greater facilities for pumping and hauling. The disadvantages in lode mining are that a considerable amount of cross-cutting is required at the different levels. The chief advantage of an underlie shaft is that it affords an opportunity of testing the lode in its immediate neighbourhood for its whole depth, and in some instances the ore got in sinking it is more than sufficient to pay the whole cost of sinking. In an extensive mine the best management would be to have one principal downright shaft for pumping, another for hauling, and several secondary underlie shafts. In Cornwall, shafts are usually rectangular, from 3 ft. to 8 ft. wide, and 4 ft. to 14 ft. long. Except in the decomposed granite timber is rarely necessary (except locally), and tubbing of timber, of masonry, or of cast-iron, as generally adopted in coal mines, is never used or required. A few instances of tubbing have come under my notice, but these were in alluvial deposits. The shafts are generally larger in hard than in soft ground. This is for a twofold reason—first, there is no difficulty in sinking a small shaft in soft ground, while in blasting a small shaft is sunk with great difficulty, owing to the want of room for the explosives to act; second, the difficulty and cost of securing the sides of a shaft in soft ground increases rapidly with the size of the shaft, while there is no such difficulty in hard ground. Owing to the irregularity of the deposits and their uncertainty, the Cornish practice of sinking many shafts, and using them more or less exclusively for certain departments of the work, as pumping, hauling, communication, &c., has many advantages over the colliery practice of concentrating all the operations in one or two shafts. In ground requiring but little support several small shafts can be sunk as cheaply as one large one, and in tender ground much cheaper, and each shaft affords opportunities of testing the lode at distinct points. Notwithstanding the favourable nature of the ground, and the general small size of the shafts, there are few of them which do not require support in some portions of their depth, and more especially near the surface, where the levels start, and in pumping shafts where the bearers for the different lifts are fixed. This support often consists of rubble masonry, the material for which is generally to be had close at hand. Still more often it consists of Norway fir, which is used as simple struts, let into the walls just were they may be required, as sets of laths, or as covered binding. These terms I shall explain hereafter. As to the cost of sinking shafts, for labour alone, it may be stated somewhat as follows, the prices being calculated to cubic fathoms instead of linear:—Sinking in soft killas: Near the surface, 2*l.* to 3*l.* per fathom; below (about 20 fms.), 3*l.* to 4*l.* per fathom.—Compact killas, or "pick and gad" ground: Near the surface, 4*l.* to 6*l.* per fathom; below 20 fms, 5*l.* to 8*l.* per fathom.—In fair blasting ground: Near the surface, 6*l.* to 20*l.* per fathom; below 20 fms., 10*l.* to 30*l.* per fathom. In extreme cases much higher prices have been paid, occasionally as much as 70*l.* or 80*l.* per fathom, or even more. At North Roskear, about 80 fms. of shaft were sunk at an average cost of 1*l.* 1s. per inch linear. As a rule sinking in "pick and gad" ground is the cheaptest since there is but little expenditure for timber.

In extensive mines, if a new shaft is required at any particular point where underground workings already exist, as sometimes happens, it is not an uncommon practice to work at it from several different points at the same time, both sinking and rising. In such cases very accurate dialling is of course required, in order that the different portions of the shaft may meet in a right line, and notwithstanding the difficulty of dialling accurately in such irregular workings, some remarkably good shafts have been thus executed. From the principal shafts levels are driven right and left at distances of 10 or 12 fms. apart, measured on the underlie of the lode. Sometimes these are driven in the lode itself, sometimes by its side, when the lode is much harder than the "country." The levels vary in size, but not so much as the shafts; 7 ft. high by 4 ft. wide is a good size for easy ground, in hard ground they are often 8 ft. by 6 ft. Although large levels are, as a rule, to be recommended, there are cases in which very small levels may be driven with advantage. Thus, in the decomposed granite in the centre of Cornwall levels only 5 ft. or 6 ft. high and 2 ft. to 3 ft. wide are occasionally driven for purposes of exploration. These small levels will often stand as long as they are required, even without timber, or with very slight support. Such levels, when not timbered, are often driven at a total cost of 8s. to 12s. per lineal fathom. As to the cost of driving levels, this will vary very much according to size, character of ground, distance from shafts, &c.; but, as a general statement, it may be said that the cost will be one-third less than shafts of equal area in non-blasting ground, and one-half less in blasting ground. Cross-cuts are levels driven across the country either from one lode to another, or from an inclined lode to a vertical shaft. The cost, of course, is the same as for levels proper in ground of similar character. Winzes are the small shafts which communicate from level to level, but do not reach the surface. They are sunk for temporary purposes only, as "passes" for the mineral, for exploration, or for the sake of ventilation or drainage, and are generally small. The mode of timbering adopted in shafts and levels is essentially the same whether the system of "covered binding" be adopted or that of "sets and laths." The first may be briefly described as a succession of solid cribs of light construction resting one on the other, while the second more resembles a series of cribs and backing deals. As to the dimensions of the timber employed, for covered binding slabs of 2 in. or 3 in. are used, and for sets and laths the sets will be "half timber," averaging 4½ in. by 9 in., or "whole timber," averaging 9 in., with laths of 1 in. to 2½ in. The "sets" for a level consist of two legs, a cap, and sometimes a stretcher, notched roughly together, and usually they are placed about 4 ft. apart. The ancient mode of getting out the ore was by means of "underhand" stopes, the men beating away the lode beneath them. But about the middle of the last century the system of overhand stoping, now universal, seems to have been introduced into Cornwall from Germany, and this is a great improvement. The men now work away the ground above their heads, thus, when the 100 fm. level has been driven, the men work away the ground between the 90 and 100 fm. levels. In this way the ground is worked away much more advantageously, the face of work is cleaner for boring or wedging, the explosives act more effectively, and there is no annoyance from streams of water. Moreover, the good ore, when broken, is more easily separated from the waste, which always comes down with it, and, as the level itself is kept clear of *debris*, the ore is more easily conveyed to the shaft. The "deads" accumulate under the men's feet, and, to some extent, serve as a staging upon which they may stand. To reach the ore face as the lode is worked away above them, a system of "stulling" is often adopted, stout timbers being let into both walls of the lode to serve as staging for the men and for the rubbish, so keeping the levels below open for tramming the stuff. No regular system of leaving pillars is resorted to, nor is any such expedient required. In the first place, the walls of a lode are generally somewhat silicified and hardened, and this tends to prevent falls of ground. Then the considerable angle which the lode makes with the horizon also favours stability. Again, even in the richest lodes, and in their richest portions, there are usually poor portions which will barely pay for removal, and if the lode should be very rich for a great space, the cost of a strong strull, piled up with deads so as to form an artificial pillar, is neither felt nor grudged. In some instances large quantities of rubbish have been sent down from surface as filling, shafts being sunk for that purpose. Moreover the ore left standing around the comparative multiplicity of shafts and levels which have to be kept open for communication affords considerable support. In the stopes the cost of breaking the ore and selecting the stuff for surface of course varies considerably, but as an average it may be taken at from 3s. 6d. to 8s. per ton, according to the size of the lode, hardness, equality of produce, depth of the "pitch" from surface, &c.

The mode of dealing with the men in the Cornwall mining district is deserving of attention. The persons employed may be divided into four classes, as follows:—The agents are the managers, the underground captains (three or four in a large mine), the captain of the dressing-floors, and often the chief clerk or accountant. These in general form a little parliament to discuss the affairs of the mine, meeting each other in the "account-house". They have usually the privilege of absenting themselves occasionally from the mines by arrangement among themselves, without loss of pay, and are even allowed to inspect and report on other mines—an advantage to themselves and owners. In the second-class we may place the sub-agents or working agents, the "owners' account" men (including the smith, carpenter, and engine-men), the boys and girls employed on the dressing-floors (called the dressing-pare), and the account-house woman, whose duty it is to keep the account-house in order, and to wash and dry the captains' clothes when they come from below. The pay of this class is mostly calculated by the number of "items" they work, but the account-house woman has a fixed monthly salary. The working hours of the owners' account men are usually 10; the engine-men are commonly on duty 12 hours. The great bulk of the work underground is now generally done by tutwork men, who bargain to do a certain amount of sinking, driving, stoping, tramming, and the like, at per ton. Very often they work in partnerships of three or four, sometimes voluntary, sometimes arranged by the agents, and their bargains are usually for one month, although sometimes for two or three months. The fourth class of workmen are the tributers. These are the best of the miners, who, instead of bargaining at per ton or per fathom, agree to work a particular part of the mine, called a "pitch," at so much in 1*l.* on the value of the ore obtained. In a rich part of the mine this tributs is low, 2s. 6d., 1s., or even less in 1*l.*; and as by the unwritten law of the mines men are not removed from a pitch against their will, except for some very strong reason, instances are known in which they have taken pitches at ½d. in 1*l.*, so as to get a *locus standi* in the mine. The wages of the owners' account men are fixed by the agents. The tutwork and tribute bargains are also, of course, privately valued by the agents, but the actual bargains are made on the setting-day in a sort of public auction. The agent reads out the conditions of the bargain, and the spokesmen of the different working parties or "pares" then offer to do the work at a particular price. If this price accords with the captain's views, and there is no more favourable offer, the bargain is at once set. If not, the captain announces his price, and if no one accepts it they pass on to the next bargain, leaving that one unsettled to be afterwards set by private arrangement, or "left idle" at the discretion of the agents. Many instances of tribute bargains turning out favourably after being idle for years are known and constantly talked of by the miners. To ensure economy in the use of tools and materials, these are supplied by the agents from the mine stores as required, and their value charged against the men's earnings each pay day—once a month. In the case of tribute bargains, another charge is made for hauling and dressing the ore at per ton, the terms of which are specified when the bargain is originally made. This is done to induce a proper selection of the ore underground, and it generally works very well. A great deal of judgment is required in regulating the due proportions of these different classes of work. The agents, of course, must be paid by fixed salary; and the number of sub-agents should not be too much limited. But as a rule it will be well to do away with owners' account men as much as possible. All shafts, levels, and tramming will be most economically done by tutwork, but when the drivages are carried in the ore ground it is often well to add to the price per fathom a proportion of the value of the ore obtained. If some arrangement of this kind be not made, good ore is apt to get mixed with the rubbish and lost. As to the stopes, when these are large and even in quality they will be most advantageously worked by tutwork, but when small or very irregular in quality tribute bargains will be found to yield the most ore at the lowest cost. A great many valuable discoveries have been made by tributers, more especially in former times; and I have no doubt that many have been missed in mines of late years simply because tribute work has been discouraged or abandoned. Generally in Cornwall the agents are taken from the working miners, except the clerk, and sometimes the manager and the best mining captains have usually been tributers and not tutwork men. The lodes of Cornwall being generally hard, and enclosed in hard rocks, the question of explosives is a very important one. Before the time of Elizabeth the ancient German mode of lighting wood fires in the "end" of them, and suddenly cooling the glowing rock with water was resorted to in the comporatively shallow mines of that time, and this mode of working is still, I believe, in existence in some Bohemian mines. About 300 years ago, however, the use of gunpowder was introduced, either at Godolphus Copper Mine, or at the neighbouring mine of Wheal Vor, in the parish of Breage. This continued to be used almost exclusively till about 10 years ago. Since that time guncotton, dynamite, lithofracteur tonite, and many other explosives have been used, but powder still holds its ground on account of its relative cheapness, except in very hard or very wet situations. But for the difficulties occasioned by legislation in the transit and storage of dynamite, and its consequent increase of cost, I believe its great strength and comparative safety would have led to a very much more extended use than at present, and it is high time that these restrictions should be removed. Boring machines in lode have been tried again and again in Cornwall during the last 10 years, and at last with success. Doering's machine was the first to be tried, at Tincroft and Dolcoath, about 1868, but this was not a success economically. Since then many machines have been tried, and although all would bore holes very well, such difficulties were met with in their application that they have been given up one after another. The most recent experiment, however, has been made at Dolcoath, more than 700 yards from the surface. The machine used is the Barrow rock drill, which is worked by compressed air. The result of many months' experience is that levels in hard ground may be driven three times quicker and 20 per cent. cheaper than by hand labour, and at the same time the ventilation of the mine is considerably improved. The time cannot be far distant when all lode mining in hard ground will be largely effected by means of this or some similar machine. The lecturer then went on to describe, but very briefly, the other parts of the mining operations in Cornwall. Haulage: Kibbles, skips, size, contents, &c., generally less perfect than in the colliery districts, owing to irregularity of shafts; of quantity to be raised from given point; variations in depth, &c.; necessity for keeping tributers' portion apart; stuff handled too many times; common use of wire rope in modern times. Sorting at surface: Spalling, hand-picking, stone-breaking, crusher, stamps. Dressing: Jiggers, buddles, knife-buddle. Treat-

ment of slimes, racks, frames, Frue vanner. General principles of treatment: Separation of particles of ore from gangue; principle of sp. gr. Special study of mineral character and mechanical condition of the ore; necessity of chemical treatment of mixed ores. Average produce of ore as sold: Tin, 65 to 70 of metal, or from 80 to 90 of peroxide; copper—yellow ore, 6 to 7 per cent.; grey ore 14 to 20 per cent.; lead, 60 to 80 of metal. Average produce of ore as brought to surface:—Copper certainly not more than 4 per cent.; tin, from deep mines, 4 per cent.; shallow mines, 1 per cent.—average of Dolcoath for several years, 2⅛ to 2¼ per cent.; of bottom levels, 8 per cent. Pumping: System of plunger lifts, drawing lift; quantity of water to be lifted, 600 to 3000 gallons per minute. Duty of engines, generally good as compared with other districts; not so good as formerly, owing to age of engines, changes of direction in rods, obstruction of pumps, &c. Ventilation: Mostly natural, pretty good. Value of practical knowledge, as seen in the mines of Cornwall, found in every part of the world. The lecture was largely illustrated by a fine series of diagrams, which had been prepared by Mr. Collins and others for the Institution of Mechanical Engineers at Birmingham, and which were kindly lent by that Institution.

Meetings of Public Companies.

ANGLO-AUSTRALIAN GOLD MINING COMPANY.

An extraordinary general meeting of shareholders was held at the offices, Austinfriars, on Monday,

Mr. E. W. WINGROVE in the chair.

The meeting was called for the purpose of passing the following resolution:—"That the Anglo-Australian Gold Mining Company (Limited) be wound-up voluntarily."

The CHAIRMAN said he supposed all the shareholders were in receipt of the circular letter which accompanied the notice calling the meeting to-day, in which it was stated that the time had now come when some definite action must be taken with regard to this property. Mr. Lamb, the mortgagee, who had a claim on the mine and machinery amounting to about 1100*l.* in round numbers, had given notice that he required to be paid, having given the full time which he agreed to do when they met about a year ago on the affairs of the company. The money which was then raised had been sufficient to put the mine in a very promising position. The directors did not rely solely upon the reports of their own agents, but they instructed Mr. Bland, who was the manager of the old established Port Phillip Company, to obtain for them a thoroughly independent and reliable report upon the prospects of the Anglo-Australian Company's Mine. For that purpose he engaged the services of Capt. Lewis, of Clunes, who was well known in the colony as a man of undoubted and unblemished reputation and great ability, and as perhaps the best man who could be selected. Mr. Lewis, under date Feb. 16 last, had reported to the board, and, in its general features, that report confirmed what they had heard of the mine from time to time from Mr. Lamb and their own agents. Mr. Lewis was not a sanguine man, and described the mine as being very promising, and well calculated to repay the outlay of further capital.

The report of Mr. Lewis was read as foltows:—

Feb. 16.—In accordance with your instructions, I proceeded to Fryer's Town for the purpose of inspecting the mine of the Anglo-Australian Company, and I now beg to submit for your consideration the following report thereon:—The claim is situated on the southern slope of a hill, in the direct course of the proved auriferous lodes of the district. It is about 1 mile north of the township of Fryer's Town, and immediately adjoins the north boundary of the Ferron's Company's claim. The machinery consists of a Cornish beam engine, which is pumping and winding from the mine, and also working a 15-head battery of revolving stamps. The whole of the machinery is in good order, and working very economically. There are two lodes or reefs in the claim, an eastern and western, having a shaft sunk on each lode, with pumps in both shafts. The western lode has been explored at the 120 and 220 ft. levels. A winze has been sunk partly on the footwall of the lode connecting the two levels. The lode at the lower level is about 20 ft. wide. A very small quantity of quartz has been crushed for this level which proved unremunerative; still I do not consider this by any means a fair trial of the lode, as it has not been driven on its course either north or south, without which it cannot be said to be prospected, it being an acknowledged fact that shoots of rich gold-bearing quartz are to be found in immediate proximity to barren runs of stone in nearly all the Victorian gold mines, and unless the lode is driven on its course these shoots may not be intersected. I, therefore, am of opinion that this lode is well worthy of further development at some future time, when probably ampler funds would be available for the purpose. The eastern shaft is sunk to a depth of 385 ft., where it has been discontinued. No. 1 level is opened out at 210 ft. from surface, and a cross cut driven east 225 ft.; nothing of importance was, however, discovered in this cross-cut; apparently it has not been driven far enough east to intersect the lode at present being explored in the lower level.

No. 2 level is opened out 320 ft. deep, and has been extended east 231 ft., the present end being in clean country, having no appearance of its containing a lode. At 100 ft. from shaft a fault or cross-course was intersected, bearing about 28° north of west, and underlying south 30° west. A rise 18 ft. high was put up on this cross-course for the purpose of intersecting a small flat leader which was gone through near the shaft; it was found to be unremunerative. The eastern lode was discovered 195 ft. from the shaft. Its direction or bearing is about 5° west of north, having an underlie of nearly 35° west. The walls of the lode are in places well defined, but contain very little quartz. This is the case for nearly the whole distance driven south—170 ft.—with the exception of about 20 ft. from the present end, where bunches of quartz are making in the lode and in the adjoining country. The last crushing from the drive and stope returned nearly 12 dwts. per ton, a result which I need not say is highly remunerative. The inspection of the Anglo-Australian Company's mine, in consequence of the short length of lode opened up and the small quantity of quartz contained therein, afforded very insufficient evidence of the character of the lode. The manager of Ferrons Company kindly permitted me to examine the underground workings of that company, and from the characteristics of the lode which present themselves in this claim my opinion of the value of the southern portion of the Anglo-Australian Company's claim is founded. For your information I enclose a rough sketch of part of the two companies' claims; its accuracy I do not vouch for, as it is not surveyed, but it is near enough to give you a general idea of the position of the lode and the prospects of the Anglo-Australian Company. The character of the lode in Ferrons mine (as will be seen from the transverse section) is of a peculiar formation, being composed of small leaders and bunches of quartz intersecting the country in the immediate vicinity of the lode in various directions, but mostly horizontal. Their returns are obtained from these leaders, and which I was informed were very satisfactory. The leaders dip north, parallel with the planes of bedding of the country (which is mostly slate), and as these leaders are driven within 100 ft. of the boundary, and still strong in the face of the drive, there is every prospect that the Anglo-Australian Company will obtain the same shoots of payable quartz. I believe it to be only a question of time and money.

The Ferrous Company have large quantities of payable quartz in sight, having every appearance of holding down. The dip of the payable shoot of quartz has not yet been proved. Mr. Raisbeck is of opinion it is about 7° north. I think it will be found to be nearer 20° north, and that it will cross the planes of bedding of the country, which at present dip about 7° north. The two angles of supposed dips are shown on the longitudinal section by two sets of dotted lines, the black representing 7° and the red lines about 20° north. Whatever the dip may eventually prove to be, it will not materially alter my recommendation for the future development of the mine, which is as follows:—1. To push on as rapidly as possible the south drive in No. 2 level to the south boundary, previous to reaching which there is every probability of intersecting the shoot or payable quartz now being worked in Ferrons Mine.—2. To sink and connect the south shaft at the old workings with No. 2 level for air, and the proper development of this portion of the mine at the lower levels.—3. To sink the sump-shaft and open out another level 100 ft. below the present No. 2 level, and when the cross-course is struck it should be driven on until the lode is intersected, as in consequence of its character being soft flookan it can be driven for less money and in less time. Another feature is that it shortens the drive to the payable shoot of quartz. It will be seen from the plan the deeper the shaft is sunk previous to driving the cross-cut (having due regard to the working of the stopes) the greater the quantity of payable quartz will be obtained for the money expended, whatever dip the quartz may take. I am of opinion the above works should be carried on simultaneously, because the cost of management and surface expenses would not be materially increased thereby, the time necessary to reach the payable quartz would be shortened, while the improved prospects of the mine at the present time fully warrant your expending the necessary outlay. An illustration of the effect of stopping a mine when nearest a successful termination may be instanced in the immediate neighbourhood—the Duke of Cornwall Mine, which I am informed is paying the present owners (Messrs. Rowe Brothers) handsomely. I feel considerably obliged to Mr. Clark, Mr. Raisbeck, and also the manager of Ferrons Company, for the facility and courtesy afforded me during my inspection.—JOHN LEWIS, M.E.

The CHAIRMAN went on to say that subsequent to the receipt of that letter the manager, Capt. Raisbeck, made a discovery on further driving south, which he spoke of as a very important one, and stated that he was proud of the discovery which he had made. He stated that he had struck some gold-bearing quartz, which the manager of the adjoining mine had not had, and 63 tons of the quartz gave an outturn of 53 ozs. of retorted gold, which was a very handsome return, and by the mail which came in the morning intelligence had arrived that 70 tons more had been crushed, with a yield of 29 ozs. of gold. This last despatch was dated April 16. The pecuniary result of the month ending April 14 was, that the manager had received 107*l.* for gold, and his expenses had been about 121*l.*, but the month before he made a profit of 100*l.* upon the working. The amount was small, but still it was an important, interesting, and, he thought, encouraging fact. If the the mortgage debt were paid, the operations at the mine could be continued as at present; but it would be a very slow and tedious process to bring it to a good permanent paying state, as to carry on the proposed works, even to a limited extent, 18 months would be required to do without capital what could be accomplished in five or six months with the requisite funds at command; but there was the difficulty of the debts staring them in the face. Three schemes presented themselves to the minds of the directors, which they had submitted to the shareholders to determine which they would like to adopt. The three alternative schemes were as follows:—

First, that the shareholders, or a syndicate of shareholders, be invited to subscribe to a loan of 5000*l.* on mortgage of the entire assets of the company, to bear interest at the rate of 10 per cent. per annum, the principal sum to be repayable at the end of three years, which amount can be borrowed under the 73rd section of the Articles of Association, and in this case it would not be necessary to wind up the present company.—The second, which the directors recommend, is to wind up, and re-organise the company. The new capital to be divided into 20,000 shares of 1*l.* each, of which 5000 shares are to be given to the old shareholders in purchase of the property, 5000 shares to be subscribed for, and 10,000 shares to be given as bonus shares to the 5000 cash shares. The carrying out of this scheme will depend on the co-operation of the shareholders.—Third, that the company be wound up voluntarily, and the property sold to the best advantage by the liquidators appointed. Under the 163rd clause of the Articles any member alone, or jointly with others, may become the purchaser.

He (the Chairman) went on to say that he thought the re-organisation of the company was fair and equitable towards all parties. The original shareholders would to some extent be compensated, and those who subscribed fresh capital would get three-fourths of the mine. He might, mention, however, that as no syndicate of shareholders had offered to subscribe the 5000*l.*, therefore he had only to put the resolution that the company be wound up voluntarily, which must be confirmed at a future meeting, when a liquidator must be appointed, and then the liquidator would take the instructions of the shareholders as to what they would do with the property. If a new company were formed, some of the present members had intimated their intention to subscibe towards the new capital, but they would not take upon themselves the burden of forming an entirely new company. He should be happy to give every information in his power.

Colonel SHARPE: Is it absolutely necessary to have 5000*l.*?——The CHAIRMAN said they wanted 1500*l.* to pay off the debts; Mr. Clarke, the agent, and Captain Raisbeck thought that 1500*l.* would be sufficient to sink the shaft 100 ft. more, and drive under the old workings; then erection of the engine would cost 500*l.*, so there would not be a large margin left out of the 5000*l.*

Colonel SHARPE: Does the mortgagee press?——The CHAIRMAN: Yes, he does.

In answer to a further question the CHAIRMAN said they could just scrape on if another 1500*l.* were subscribed; but, of course, that amount would not enable them to properly work the mine.

Mr. R. L. M. KITTO asked what proportion of shareholders had been advised of this meeting being held?——The CHAIRMAN: Everyone on the register.

Mr. KITTO: What is the proportion of shares on the register?——The CHAIRMAN: 18,998 shares. There are about 4000 shares not on the register, but are warrants payable to bearer; but with respect to these notices of this meeting have been given by advertisement.

Major BELL said he had noticed in the papers every report connected with the Anglo-Australian Company except the long and important one which had just been read, and it was only by accident that last Friday he knew of the mine looking better, and that for the first time the mine now seemed to be in some sort of position of promise, and yet they were told there was no hope of getting any ready money, and were called together to pass a resolution to wind up.

The CHAIRMAN said that appeal after appeal had been made to the shareholders, but when the directors asked the shareholders for money they often got no answer, and when meetings were called but very few gentlemen attended, and they got no discussion. As a matter of fact, the mine had been carried on for the past three years at the cost of a few proprietors only.

Mr. WILLIAMSON said that even if they passed the resolution to-day they need not confirm it at the confirmatory meeting if in the meantime anything could be done to keep on the company and find money to carry on the mine. He pointed out that it was to the interest of the members of the board who were large shareholders that the company should go on. He corroborated the statement of the Chairman with regard to the apathy of the general body of shareholders.

The CHAIRMAN reminded the meeting that the company would be wound-up for the purpose of reorganisation if the shareholders so decided.

Mr. KITTO suggested that if the resolution for winding up was passed sufficient time should elapse before the confirmatory meeting to allow of the shareholders being advised of the real facts of the case. If the resolution were agreed to the shareholders would be roused, and there would be no difficulty in raising the 5000*l.* He himself held between 4000*l.* and 5000*l.* worth of warrants to bearer, and so was prepared to take his proportion of 5000*l.* The whole of the 5000*l.* need not be called at once, but could be called up by instalments, as the money was required. He certainly thought the shareholders would come forward if it could be shown them that the directors were doing the best they could to pull the thing through.

Colonel SHARPE said he cordially supported the suggestion of the last speaker.

Mr. WILLIAMSON said the directors had no wish whatever that the concern should be wound-up, and they would be only too happy if the shareholders would come forward and find the money. But something must be done, or it would be utterly impossible to carry on.

Major BELL asked whether Mr. Kitto placed full reliance on the report they had heard read?——Mr. KITTO said that Mr. Lewis was one of the best men in the colony, and Capt. Raisbeck could be trusted as an honest man. But the great point which he looked at was that the adjoining Ferrons Mine was paying, and he had heard that in that mine they had paid back all the capital, and as their gold dipped towards the Anglo-Australian, it seemed at any rate that if there was any mine in the world which could be carried on with a prospect of success it was this mine, and he certainly thought that the shareholders would be wrong to abandon it.

Mr. WILLIAMSON: If the mortgagee could see the money subscribed to work the property and pay the interest, probably he would hold back?——Mr. KITTO said they could decide to hold the second meeting at the expiration of 30 days, and they might pass a resolution to offer 500*l.* to the shareholders *pro rata*, and send them the fullest information, together with a report of this meeting. He believed that if this was done it would have a good effect.

Major BELL thought it would be better to adjourn the meeting and send round to the shareholders a full report of the proceedings, and then let another meeting be held in a fortnight.

Mr. LAMB, the mortgagee, said he was prepared to take 200 shares in the event of the re-formation of the company. (Hear, hear.)

The CHAIRMAN said that in July last year there was a meeting of shareholders, at which he stated that Mr. Lamb was a large shareholder, and would rather see the thing carried on than sold, and that the shareholders must determine whether they would pay the mortgage or wind-up, and he also stated that probably a small expenditure would do what it had since done. The original shareholders were then urged to take up 4800 of the shares, of which only 2000 were actually taken up. He might mention that the last 150*l.* which were sent from the directors' own pockets.

Mr. KITTO said they could pass the resolution, but in the meantime, in the four weeks interval before the next meeting, every step should be taken to make the shareholders acquainted with the precise position of affairs, and the necessity for their coming forward at once. The effect of this meeting on the shareholders might be such that they would probably see things in a different light.

Mr. LAMB said he had now greater faith in the property than he had ever had before.

Mr. KITTO asked how they would proceed in case of a reorganisation being carried out?——The CHAIRMAN said the process would be that the winding-up resolution would be passed, and at the next meeting a liquidator would be appointed, who would take the instructions of the shareholders as to what he should do with the mine.

The CHAIRMAN said the resolution was that the company be wound-up voluntarily, and a confirmatory meeting be held this day four weeks. In the meantime an explanatory circular would be sent out.

After some further discussion, the CHAIRMAN said the resolution he would put was as follows:—"That the company be wound up voluntarily," and the understanding was that this scheme for raising money on mortgage be further brought to the notice of the shareholders.

The resolution was seconded and carried, and the meeting broke up.

ARUBA ISLAND GOLD MINING COMPANY.

An extraordinary general meeting of members was held at the offices, Gresham House, on Thursday (Mr. SMEDLEY in the chair), for the purpose of pa-sing the following modified resolutions:—

That the directors be authorised to grant a lease of all the rights conceded to the company by their concession, and to sell all their machinery, plant, stores, ores raised, and other property at the Island of Aruba, to a new company to be formed with limited liability on the following bases:—1. The nominal capital of the lessee company to be 50,000*l.*—2. The lessee company to pay the lessor company for the purchase of all their plant, machinery, stores, and ores raised at the island, and for the lease, the sum of 2500*l.* in cash, as follows: 600*l.* upon the day of the execution of the lease, and the remainder by four equal instalments at intervals of three months, and 7500*l.* in fully paid up shares at par, to enable the lessor company to pay their debts and settle with their debenture-holders.—3. The lessee company, within two years from the date of the lease, to raise and expend the sum of not less than 50,000*l.* in repairing and adapting the present machinery and purchasing and erecting new machinery, and to resume working operations upon the Island of Aruba at the earliest practicable period.—4. The lessee company, during the currency of the lease, to pay the lessor company, for the rent of the concession and other purposes, the sum of 500*l.* per annum in quarterly instalments.—5. When the members of the lessee company have been repaid out of net annual income all the capital subscribed by them, including the shares issued in respect of the debentures of the lessor company, together with interest on such capital and shares at the rate of 10 per cent. per annum, such net annual income is to be thereafter divided equally between the two companies; or, if deemed expedient, the two companies are to be then amalgamated or reconstructed, subject to such conditions and arrangements with respect to the nominal capital and to future direction and management as may be mutually agreed upon by the respective boards of the two companies.—6. That as further consideration to the present debenture holders of the lessor company, and in addition to the 7500*l.* in fully paid-up shares in the lessee company, to be distributed between them, 7500*l.* to be issued to them in bonds of the lessor company, repayable in five years from date of bond, with interest at the rate of 10 per cent. per annum, commencing from the day of the first division of the net profits between the two companies, pursuant to resolution No. 5.

The SECRETARY read the notice calling the meeting.

The CHAIRMAN said: Gentlemen, as there may be some shareholders present who are not aware of the causes which have led to the necessity of calling this meeting, and substituting another set of resolutions for those passed at the special general meeting held on Feb. 22 last, I beg to give them the necessary explanation, which is this: Upon consulting with Messrs. John Taylor and Sons, and other gentlemen who continue to believe in the enterprise, the directors found that there was no prospect of obtaining fresh subscribers to the proposed lessee company upon the terms of the resolutions passed on Feb. 22, and the result has been the drawing up of the present resolutions in accordance with terms upon which the directors have reason to believe the necessary capital may be obtained. It will be remembered by the shareholders that in the previous proposal the consideration to the debenture-holders was the full amount of their debt and interest, and to the Aruba Company 25 per cent. of the net profits. In the present proposal, which is embodied in the present resolutions, the consideration to the debenture-holders is 75 per cent. of their debt in shares of the lessee company, and a further 75 per cent. in bonds, with deferred interest, of the Aruba Company, and the consideration to the Aruba Company is an annual payment of 500*l.* for the purpose of covering the rent of the concession and expenses of management until the profits become divisable between the two companies. Such an arrangement with the debenture-holders became necessary, so as to leave the requisite amount of capital for carrying on the operations of the lessee company, in the early success of which the Aruba Company is, of course, greatly interested. The substitution of a fixed annual payment of 500*l.*, instead of 25 per cent. of the profits, would appear at first sight unfavourable to the Aruba shareholders, but in reality it merely defers their immediate advantage for the more speedy division of the whole profits between the two companies. The directors have reason to believe that if these resolutions, which I can tell the shareholders represent a vast deal of time and anxiety on the part of the directors, are found acceptable and are passed by the meeting, the necessary capital will be subscribed, and active operations would then be resumed upon the island under the direction of Messrs. John Taylor and Sons. I regret to have to announce the unfavourable decision of the High Court at The Hague in the matter of the phosphate lawsuit. This decision was only announced on the 1st inst., and is final. The company were most ably represented by their counsel—Mr. Kappeyne. In view of this the directors have framed the following resolution, which they hope the meeting will pass:—

"Having regard to the strong moral claims possessed by the company to a concession of the phosphate of lime from the Dutch Government, the directors are hereby authorised and empowered to make such arrangements as they may deem expedient, with a view to obtaining such concession, which arrangement shall reserve to the company an interest of not less than 10 per cent. on the net profits derived from the working and sale of the phosphates."

In conclusion, he (the Chairman) formally moved the following—

"That the directors be authorised to grant a lease of all the rights conceded to the company by their concession, and to sell all their machinery, plant, stores, ores raised, and other property at the Island of Aruba, to a new company to be formed with limited liability on the bases given above."

Mr. DAWSON seconded the resolution, which was put and carried.

The meeting was then made special for the purpose of passing the following resolution:—"That the second part of Article 60 of the company's Articles of Association be, and the same is hereby, cancelled, and that the following be substituted for the same:—As from and after the general meeting of the members of the company, held on Feb. 22, 1876, each of the directors shall be entitled to receive in cash or securities, or partly in cash and partly in securities, remuneration at the rate of not less than 100*l.* per annum, one-half whereof shall be deemed a retaining and fixed fee, and the other half shall be divided between the directors in proportion to their attendances at the meetings of the board. Provided always that no director shall be entitled to the said retaining and fixed fee who shall have absented himself from attendance for three consecutive months in any one year, in which case the said retaining and fixed fee shall be distributed amongst the other directors in such proportions as they may mutually agree upon."

The CHAIRMAN said he thought the shareholders could not wish the directors of the company to give so much time and attention to the affairs of the company without being paid. They had never yet received a penny. According to the Articles of Association the directors could only be paid out of profits, which had hitherto been nothing, and, therefore, it was proposed to substitute the Article given above for the Article now in existence.

Mr. NORRIS said he had pleasure in proposing the resolution given above.

Mr. SEWELL seconded the resolution, which was put and carried, and the meeting, after passing a vote of thanks to the Chairman, broke up.

CHONTALES CONSOLIDATED MINING COMPANY.

The ordinary half-yearly meeting of shareholders was held at the offices of the company, Gresham House, Old Broad-street, on Wednesday, Mr. PARKE PITTAR in the chair.

The CHAIRMAN said he had to apologise for the absence of the Chairman of the company, Earl Nelson, who was expected to arrive every moment; he could not think what was detaining him. He would, however, open the formal business of the meeting, and perhaps by that time Lord Nelson would have arrived.

Mr. J. J. TRURAN (the secretary) then read the notice convening the meeting and the directors' report:—

In presenting their usual half yearly report the directors regret to state that the result has been unfavourable. The quantity of ore treated during the six months ending December last was 3263 tons, which produced 670 ozs. of gold, or an average of 4 1-10th dwts. per ton. The cost of breaking, raising, and dressing this ore, including management at the mines and in England, was 3313*l.* 4s. 3d., equal to 20s. 3d. per ton of stuff, whilst the total receipts were 1774*l.* 6s. 11d., showing a deficit of 1538*l.* 17s. 4d. The directors have been for some time past dissatisfied with the management at the mines, which has resulted in their recalling Mr. Danby, and appointing Mr. William White his successor. The reasons which have led the board to adopt this course will be more fully explained at the meeting. Mr. White sailed from Southampton on May 17, and the directors believe they have in him an officer of character and integrity, who will look after the interests of the company, and do his best to work the mines for the benefit of the shareholders. In the directors' report issued for the meeting in November last the shareholders were informed that the Wheeler pans had been ordered from San Francisco, as requested by the manager. These arrived in January, and up to the date of the last advices from the mines one only had been erected. The spur-wheel and pinion were delivered at the mines, and attached to the water-wheel in November, but the manager states that owing to a scarcity of water he was unable to use the wheel for driving the usual number of stamps, and, consequently, the quantity of ore crushed has been small. No particulars have been communicated to the board as to the result of treating the tailings or working the Wheeler pans. The mill at Estrella is reported to be in the same condition as six months ago, and the directors are not aware that the turbine has yet been completed. The manager reports that he has had no difficulty as regards labour. The position of the company is, no doubt, still a somewhat anxious one to your directors, but they hope that the mines are sufficiently opened to keep the machinery which has been supplied constantly at work, and with a change of management they look for better results. Mr. Danby's report is appended hereto as usual. Should any shareholder be unable to attend the meeting on June 6 the directors request he will fill up and return the enclosed proxy before 12 o'clock on Monday, June 4.

The CHAIRMAN then said as Lord Nelson had not arrived he would address a few words to the meeting, and he would briefly refer to the directors' report. From that report the shareholders would have seen that the directors had been obliged to cancel Mr. Danby's engagement, and to re-appoint Mr. White. This was a gentleman in whom the directors had every confidence, but after the many disappointments they had met with in their managers he thought it best not to speak too positively about that matter, but the directors were of opinion that Mr. White was the man to bring the company out of its difficulties if anyone could. He was very sorry to say that the drinking habits of the people in the neighbourhood of the mine were such as to lead the men to laziness, incapacity, and carelessness. At the same time, notwithstanding all these drawbacks, the board never wavered in their opinion of the intrinsic merits, of the property, and they intended, with the support of the shareholders, to go on "pegging away," hoping that success would ere long attend their efforts. As the report gave the full details of all the operations he would not detain the shareholders with any remarks of his own, but if any of the shareholders desired any additional information he would be very happy to give if to the best of his power. He moved the adoption of the report and accounts.

Mr. JOHN O. HANSON seconded the motion.

Mr. CREAK said he quite agreed with the board as to the value of their property, but he thought that the management on this side had been lax in not keeping itself better informed upon what was proceeding at the mine. They had sufficient machinery, which encouraged the hope that if only the mine had fair play from those appointed to superintend it the shareholders would get an adequate return. He was a shareholder of the company in Mr. Belt's time, also in Mr. Smeddie's time, then in Mr. Danby's time, and now with the mine being superintended by Mr. White, and no good results had followed in any case so far. At the same time, he must say that he fully realised the difficulty of managing a property situated 3000 miles away. He wished to suggest whether it would not be wise to infuse new blood into the board, or to endeavour to enter into a working arrangement with the Javali Company, by which a thoroughly competent man might be secured, who could have a large salary paid him if the two companies divided the payment into equal proportions. The famous St. John del Rey Mine was saved by good management, and with better management he believed that this concern would be productive of much better results than had thus far been obtained.

Mr. PALMER said he represented the shareholders in Bristol, and he thought that city should be represented on the board. He complained that the Estella mill had not been properly utilised, and concluded by recommending that the board should add to their number Mr. Weatherhead, a large shareholder of business habits living in Bristol.

A SHAREHOLDER thought it undesirable at present to increase the number of directors, and suggested that the better plan would be to give the present manager, Mr. White, six months' trial before any change whatever was made in the management of the company either at the mines or on this side.

Another SHAREHOLDER said he wished to hear the opinion of

the board upon the subject of an increase in the directorate. He also wished to know the present financial position of the company—that was as close as it could conveniently be given.

A SHAREHOLDER complained of what he considered a want of energy on the part of the directors. So far as he was aware, not one member of the board had ever visited the mines to see how things were going on there, although a visit of this kind might have done a great deal of good.

The CHAIRMAN, in reply, said the board had done everything that any men could do to ascertain the character of the managers whom they had sent out to the mines; and, whatever the results of those appointments might have been, it was certainly not due to any want of attention on the part of the directors, Personally, he could not have given more attention to the affairs of the company if the property were entirely his own. He had placed 8000*l.* in the company, so that his stake was not an unimportant one. No one could more deplore the unfortunate results which had hitherto attended their efforts than the directors. The proposal with reference to an increase in the number of directors could not be entertained at that meeting, but even if it could the directors were not prepared to accept such a recommendation until Mr. White should have had a fair trial given him. As to the present financial position of the company, the balance at their bankers was just about 900*l.*

Mr. PALMER said that under the circumstances he would withdraw his proposition with respect to the number of the directors being increased by the election of Mr. Weatherhead.

The report was then unanimously adopted.

A vote of thanks to the Chairman and directors closed the meeting.

FOREIGN MINING AND METALLURGY.

The condition of the French blast-furnaces and forges appears to have experienced little change. Luxembourg pig continues to be sold at a very cheap rate, and French pig is not disposed of upon much better terms. The current of small orders for iron which has been noticed of late is still observable, and prices have been sustained without materially advancing. The Eastern of France Railway Company has let a contract or contracts for 18,000 tons of steel rails at 8*l.* 10s. 6d. per ton. The renewal of a treaty of commerce with England appears to be indefinitely adjourned. The Marshal-President of the French Republic has visited the buildings in progress for the French Univer-al Exhibition of 1878, and there appears to be no doubt that the French Government intends to proceed with the Exhibition, notwithstanding the troubled state of Eastern Europe. It appears from an official return that the aggregate production of pig in France in 1876 was 1,449,000 tons, against 1,416,000 tons in 1875. On the other hand, the production of iron in France declined from 870,000 tons in 1875 to 848,000 tons in 1876. The falling off indicated in the manufacture of iron was, to some extent, compensated for by the progress observable in the production of steel. Thus 261,000 tons of steel were made in France last year, as compared with 257,000 tons in 1875.

A rather sensible improvement has been noted in the iron trade at Brussels. Negociations have been distinguished by more firmness; orders have become less rare, and more important; at the same time, consumers have obtained favourable prices, as raw materials have not advanced. Luxembourg pig has remained about stationary. It cannot be said that a general revival has taken place in the Belgian iron trade; only intending buyers have made purchases at last, as they see that there is no probability of prices going lower. The steelworks are well provided with orders, as are the rolling mills. The proprietors of the forges are well off for orders for immediate execution. M. Chapel, for many years commercial agent of the Acoz Forges Company, has quitted that company. M. Chapel proposes to buy and sell raw materials on his own account. The Paris Chamber of Commerce has passed resolutions in favour of the suppression of the duty on coal imported into France, the abolition of the tax now levied on railway goods traffic, the improvement and development of means of transport, and a reduction of 33 per cent. in the duty on iron imported into France; a still further reduction to take place in five years. The imports of minerals and limailles into Belgium in the first four months of this year amounted to 209,000 tons, as compared with 216,000 tons in the corresponding period of 1876, and 303,000 tons in the corresponding period of 1875. The imports of rough pig and old iron into Belgium to April 30 this year amounted to 65,000 tons, against 70,000 tons in 1876, and 47,000 tons in 1875 (corresponding periods). The exports of minerals and iron from Belgium have not presented much variation this year.

A strike in the Seraing district has terminated, the men on strike having gone in. One result of this strike has been a diminution in the stocks held, but foreign producers have submitted proposals to Belgian consumers, and prices have experienced no variation. In the other Belgian coal basins perfect tranquillity has prevailed; there are complaints that comparatively little coal is sold; the extraction remains rather feeble, and stocks have been unimportant. The imports of coal into Belgium in the first four months of this year amounted to 210,000 tons, as compared with 237,000 tons in the corresponding period of 1876, and 218,000 tons in the corresponding period of 1875. The imports of coke into Belgium have, on the contrary, increased this year, having amounted to April 30 to 8000 tons, against 5500 tons in the corresponding period of 1876, and 4800 tons in the corresponding period of 1875. The exports of coal from Belgium declined in the first four months of this year to 930,000 tons, against 1,100,000 tons in the corresponding period of 1876, and 1,200,000 tons in the corresponding period of 1875. The exports of coke from Belgium to April 30 this year were 162,000 tons, as compared with 169,000 tons in 1876, and 223,000 tons in 1875 (corresponding periods). Contracts are to be let on June 12 for coal required for the Belgian State Railways.

Some observers profess to consider that there has been a slight improvement in the French coal trade, but it is difficult to state upon what ground such an assertion is made. In the basins of the Nord and the Pas-de-Calais prices have acquired no additional firmness, and on the contrary transactions have exhibited indecision. The movement of coal from the basin of the Loire appears to have increased, but prices have remained much the same. Upon the Paris coal market business has been dull, as few persons have been laying in supplies. Stocks at the same time are heavy, and the arrivals have been considerable.

Business in copper has been inactive in Paris, and prices have been tending downwards. Transactions in copper upon the German markets have been relatively limited. At a public sale of tin which has just taken place at Rotterdam, Banca realised from 42½ fl. to 42¾ fl. The current quotation for Billiton has been 41½ fl. There has not been much doing in tin at Paris, and prices have been drooping. There has not been much business passing in lead at Paris. The German lead markets have, however, been very firm. Zinc has been quiet at Paris; upon the German zinc markets there has also been comparatively little business doing.

NEW ZEALAND—MINING IN THE PROVINCE OF AUCKLAND.—The mail delivered during the week brings intelligence of one of the greate-t discoveries yet made in the province. The discovery is at the Moanatairi Mine, in the Thames gold field, not a great distance from the celebrated "Caledonia" Mine, which in two years returned half a million sterling from a depth of 50 fms. The Moanatairi Mine was productive to a depth of about 200 ft., when the lode became very poor. The company, nevertheless, decided to carry on operations, although at a great loss; and, after working for over two years, struck the lode again nearly 100 ft. deeper, when it was found to be from 8 ft. to 10 ft. wide, and almost solid gold. The returns since have been enormous—for the fortnight ending March 3, 709 ozs.; March 17, 4,913 ozs.; March 31, 16,662 ozs. Making a total of 22,284 ozs., of the value of 70,000*l.* The yield for the last week of the above return was 10,298 ozs., and the profit for the fortnight reached the amazing sum of 43,000*l.* The fortunate shareholders have received in a little over a fortnight over 60,000*l.*, being 4*l.* 10s. per share. The last report says: "The present aspect of the mine warrants the prediction that the returns from the present level will continue splendid, to say nothing of the block underfoot, which according to all precedent should not only equal but exceed the block now worked. The height of the present block is 80 ft., by any number of feet in a south-westerly direction." This is another instance of the success attending persevering efforts in mining, and should act as an encouragement to shareholders in other concerns, and warn them against the folly of letting their property be sacrificed when a sustained and united effort would, in the majority of instances, effect a great success.

MINING IN AUSTRALASIA—MONTHLY SUMMARY.

MOONTA MINES.—From the half-yearly report of this extensive mining property we note that the operations are well sustained, the quantity of ore raised during the six months ending March 20 being 12,474 tons, averaging 20 per cent. of fine copper. At the beginning of the half-year the company had 2380 tons on hand, so that the directors have had 14,854 tons to deal with. Of this they have sold to the Wallaroo Smelting Company, under the agreement entered into some time since, 10,857 tons, thus leaving 3997 tons still to be disposed of. The amount paid for the 10,857 tons was 114,558*l.* 19s. 4d., or about 10*l.* 11s. per ton. Against this the working expenses have been 100,580*l.* 12s. 2d., showing a profit of nearly 14,000*l.* independent of the ore on hand, which is now valued at 12*l.* per ton. The total assets are set down at 232,652*l.* 14s., the estimated value of the buildings and fixed machinery being 165,099*l.* The liabilities amount to 56,388*l.* 14s. 3d., so that the balance to the credit of profit and loss stands at the handsome amount of 176,264*l.* Analysed closely, the operations of the half-year will be found to have yielded about 33,000 net profit, or just enough to meet the two quarterly dividends of 10s. per share, which have been paid. Mr. H. R. Hancock, the superintendent, furnishes a report of the various workings on the mine, and states that the prospects generally are of an encouraging character, while the plant and appliances are in good order. There are no less than 28 shafts, the yield from which varies from 1 to 7 tons of ore per fathom, the quality of the ore varying from 15 to 30 per cent. The company's establishment at present consists of 18 officers, 951 miners, 93 mechanics, 374 labourers, and 248 boys, the total being 1684. The report must, on the whole, be considered to be satisfactory. The yield of the various lodes has been well maintained, and the price of copper, though not so high as might be desired, has been sufficiently high to prevent any lapse in the dividends taking place.

BURRA BURRA.—The meeting of the South Australian Mining Association was held at Adelaide on April 19 (Mr. John Beck in the chair). The accounts showed that the ore produced from the Burra Burra Mines during the half-year amounted to 803 tons, which is estimated to yield an average of 27 per cent. of fine copper. The value of the ore was 14,249*l.* 18s. 9d., and the rent and fees received brought 1544*l.* 2s. 6d.; making together the sum of 15,754*l.* 1s. 3d. The cost of working the mine, including the expenditure of about 640*l.* in sinking the shafts, extending the deep levels, and the prosecution of other exploratory operations during the same period was 21,856*l.* 15s. 5d., the excess of expenditure over receipts being written off the profit account, which was thereby reduced to 7298*l.* 17s. 5d. The cost of working the mines for the past six months, inclusive of the outlay of 7550*l.* during that period in proving the mines in depth, will absorb the balance standing at the credit of profit account, and leave a deficiency of 2267*l.* 16s. 6d. This the directors hope soon to see liquidated and the finances generally improved by the returns from profitable courses of ore, which may be reasonably expected at an early date from the promises contained in Capt. Sanders's report on the mines. About 27,000 tons of stuff have passed through the machinery—Tower, 95.0 tons, yielding 242 tons of 32 per cent. and 41½ tons of 17 per cent. ore; the 30 heads of stamps for two months and 20 heads for four months have passed through about 17,000 tons, yielding 176½ tons of 25 per cent. ore; tributers' yield, 242 tons of 26 per cent. ore: total for the half-year, 803 tons 2 cwts. 1 qr. We have 14 pitches working by 41 men and 7 boys, at from 10s. to 12s. in *l.* The establishment comprises 300 hands.

THE KURILLA.—Good accounts continue to reach us of this mine, the general opinion being that, with a scale of operations equal to its demands and its actual value, it would at a very early date take its place among the dividend mines of the Peninsula. This view is shared in by its manager—Capt. Anthony, and even on a very limited scale it would appear he is making it pay its way, and could make fair profits with a better price for copper. We hear of a sale of ore made last week to the Wallaroo Company of 135 tons, making over 120*l.*, or a net value of 9*l.* per ton, with the copper contained in it not realising more than 10s. per unit, or 50*l.* per ton. Although the above quantity is just removed from the floor, there is a pile of 100 tons now ready for sampling over 20 per cent. pure copper, besides several heaps being added to for sampling next month. At the 45, on the old lode, we hear that the lode has during the past month assumed extraordinary dimensions and value, being over 3 ft. wide, of solid ore, and valued at 100*l.* per fathom, although it did not keep up to that value. It is said that were the mine deepened on this lode splendid results would follow, as the lode, which was only patchy and disordered at the upper workings at the 25 from the surface consolidated, and was worth over 50*l.* per fathom, besides throwing of a "rose" of great value into the strata. In seeking this fine run of ore at 10 fms. deeper by driving east they met with it just 10 fms. earlier than at the 35, showing that it is lengthening as it deepens, and it is at the deepest struck point where it is so rich. On the new lode called Morphett's, the prospects are equally good, for although no such rich deposits have been found, the yield of ore is less fitful than on the old lode, and the lode made ore for a length of 90 fms. in the shallow drive. The engine shaft is complete to the 20, and sinking is carried on 3 fms. below this level, and the 20 fm. drives being both east and and west, with good prospects. A set-am-engine is erected for discharging these separate workings of water and stuff. Although it is not yet set to do what will by-and bye become its daily task, a trial has been made of its motions, which was of a most satisfactory character, reflecting credit on the makers, and the engineer who erected it, under the supervision of Captain Anthony, Mr. W. H Trevorrow. Under any circumstances this mine must go ahead and do well, but to make it a great mine and realise early profits a broader system of working is most certainly required.—*Wallaroo Times*, April 18.

The last crushing from the Lady Alice Mine gave over 40 ozs. of gold, a better result than has been obtained for some time. We are glad to learn that the lower levels of the mine are looking more promising than they have done, and the prospects have considerably improved. During some months past a good deal of deadwork has been done, and the ground being opened up, better results are expected.

The new gold-field near Echunga, which has been named Biggs's Flat, is turning out very well.

Prof. Tate, of the Adelaide University, has commenced a series of popular lectures in the Institute relative to the geology of South Australia.

The National Bank half-yearly report shows the net profit on the transactions of the past six months to be 58,898*l.* A dividend at the rate of 12½ per cent. on the paid-up capital has been declared.

Gaslight beacons are to be erected in the Port River, to facilitate the navigation by night. The estimated population of the colony at the end of December last was 225,677 persons, made up of 117,208 males and 108,469 females.

Our wheat statistics show that the late harvest yielded about half a crop, the return per acre being 6 bushels 43 lbs. The total yield was 5,857,569 bushels, which will allow us about 80,000 tons of breadstuff for export, after providing for our local wants. Prices have again risen, and the top quotations are 6s. 7d. per bushel for wheat, and 15*l.* 10s. for flour. We are having warm gentle rains which, coming after the heavy downpour of last month, afford great grounds for belief that we have a most prosperous season before us for the farmer and grazier. The country is looking green everywhere, with the grass and young corn as forward as in ordinary years it is a month later. The lambing is safe, and squatters who five or six weeks ago were ready to sell a large proportion of their sheep at an extremely low price, now refuse good prices for the same flocks, or will not part with them at all till after shearing.—*South Australian Register*, April 19.

AUSTRALIAN MINES.

PORT PHILLIP AND COLONIAL (Gold).—Clunes, April 14: Total quantity of quartz crushed on companies and tributers' account for the four weeks ending March 28, 5193 tons; pyrites treated, 22½ tons; total gold obtained, 2049 ozs. 1 dwt. 12 grs.; receipts (including 1987*l.* obtained from tributers), 4764*l.* 10s. 1d.; payments (including 601*l.* for firewood, mine timber, and insurance, &c.), 2696*l.* 11s. 10d.; profit, 1687*l.* 18s. 3d.; which, added previous balance of 3120*l.* 7s. 8d., made an available balance of 4807*l.* 7s. 11s. The amount divided between the two companies was 1600*l.* The Port Phillip Company's proportion of which is 1040*l.* The balance (1520*l.* 7s. 11d.) was carried forward to next month's account. Remittance, 1000*l.*

— Telegram, dated Melbourne, May 30: Month ending May 23: Gold obtained from companies quartz, 628 ozs.; gold obtained from tributers' quartz, 1475 ozs.; profit, 1944*l.*; remittance, 1150*l.*

ENGLISH AND AUSTRALIAN (Copper).—The stock of coals at Port Adelaide was 1850 tons. The smelting operations both at Port Adelaide and Newcastle were proceeding satisfactorily. Since the date of last advices 200 tons of copper had been shipped

SCOTTISH AUSTRALIAN.—The directors have received advices from Sydney dated April 14, with reports from the Lambton Colliery to the 11th of that month. The sales of coal for the month of March amounted to 12,432 tons.

YORKE PENINSULA.—The directors have advices from the committee of inspection at Adelaide, dated April 18, with report from the Kurilla Mine to the 16th. The following are extracts from Capt. Anthony's report:—Kurilla Lode: Shortly after the date of my last report the ore in the 45, east of Hall's shaft, showed signs of making ore to an unusual extent; it widened to over 3 ft. of solid yellow ore, or what would have been equal to 9 tons of over 20 per cent. ore, or only a little short of 100*l.* per fathom. Since that, however, this grand lode, for such it was, has been divided by a boulder of killas, and for the time disordered. It is now worth 2 to 3 tons of 20 per cent. ore per fathom. This is evidently the western end of the main shoot, although met with 10 fathoms earlier in driving east than the same at the 35. After driving west from Hall's shaft 2 fms., I find that there is a good straight wall on the south side, with a rich flookan, and it is in many ways a wall well worth exploring; indeed, I do not think that we should regard the ground lying between Hall's and Deeble's as barren, although it was so at the 25 west. I have resumed sinking the hauling shaft from the 35 towards the 45. The lode (the western extremity of the main shoot) is 3 ft. wide, and contains about 2 tons of 20 per cent. ore per fathom, but it will, no doubt, improve in its yield at every foot as it gets into the heart of the shoot.—Morphett's Lode: The engine-shaft is rather more than 3 fms. below the 20; the lode is 6 ft. wide, having two well-defined walls, and is a fine lode, and 2 ft. of the north portion of the lode will yield 3 tons of 18 per cent. ore per fathom, while there are small veins running throughout the other 4 ft., which is being saved for dressing. At the 20 east the lode has been spliey during the past month, and not yielding so well; it is, however, again recovering itself, and making tribute ground. At the 20 west no tribute ground has been laid open for the month, and from the southerly winding of the wall I imagine that it will again fall in with the south portion of it driven on at the 10, and I have no doubt we shall meet with a fresh shoot of ore where the two branches join. Since my last monthly report we have sold 135 tons of ore, realising 121*l.* 6s. 10d. net. I have to-day called for tenders for 100 tons of 20 per cent. ore, value (say) 100*l.* On hand, dressed and undressed, (say) 100 tons of 15 per cent.; dredge ores of 15 per cent., (say) 200 tons. The directors have also received from the committee the following telegram, date May 31:—"Kurilla prospects good; lode improving."

ANGLO-AUSTRALIAN (Gold).—S. H. Clark, Victoria, April 16: The gold obtained this month (107*l.* 12s. 6d.) has been more than we anticipated, but the air being bad we have been compelled to obtain more pipes to ventilate the mine, making nearly 600 ft. altogether, which Capt. Raisbeck thinks will be sufficient. The adjoining claim still continues to improve. I allude to the Ferrous; they are purchasing new machinery, and still paying dividends.

Capt. Raisbeck, Anglo Mine, April 16: We have extended the south drive (320 ft. level) 36 ft.; distance from cross-cut 244 ft. The stone referred to in the lode last month is gradually rising to the south, but I do not see much gold in it. We have also more leaders showing in the west side of the drive, which we cannot prove in this level as they are dipping under water, but I consider the prospects improving. We have crushed from the slopes 72 tons of stone; result, 29 ozs. reported gold. I have only extended this working 7 ft. from where the last gold was taken from. I shall break more stone from this run next month. The season of the year has been much against the progress of the work, so much so that I have had to get 300 ft. of extra air-pipes, and to send the air from the surface. The air at present is good. We have 10 tons of stone in the mill.

Registration of New Companies.

The following joint-stock companies have been duly registered:—

LITTLE WONDER MINERAL COMPANY (Limited).—Capital 6000*l.*, in 1*l.* shares. To purchase mineral property at Holywell Mountain, Holywell, Flint, particularly the Coita Bryn Mine. The subscribers (who take one share each) are—W. Davies, Princes Bridge Sawmills, Salford, timber merchant; George Platt, Clowes-street, Salford, merchant; John Atkin, Whalley Bridge, Cheshire, merchant; James Bland, Salford, merchant; W. Taggart, Alexandra Sawmills, Oldroad, Manchester, builder; James Boothman, Farnworth, builder; J. Buckley, Carrington, Cheshire, farmer. This company is registered under Table A.

GENERAL ICE FACTORY COMPANY (Limited).—Capital 150,000*l.*, in 10*l.* shares. To carry on the manufacture of ice, and to establish ice factories. The subscribers (who take one share each) are—Robert Wardrop, 13, Pemberton-road, St. John's Wood; A. Holt, 13A, Porchester-terrace, W.; M. Petrie, Hanover Lodge, Kennington Park; C. Walduck, 148, Gresham House; Robert Hinton, 2, Carey-lane, E.C.; H. Wickens, The Grange, Shepherd's Bush; H. Trautman, 1, Jeffery-square.

OUTLAY INDEMNITY SOCIETY (Limited).—Capital 100,000*l.*, in shares of 1*l.* and 10*l.* each. To organise a system for the redemption of expenditure. The subscribers are—J. H. Barber, 4, The Peldon, Richmond, 1; W. F. Fildey, 3, Abchurch-yard, 1; S. F. Porter, Walthamstowe, 10; Napoleon Gibbs, Datchet, 10; G. Long, King's road, Clapham, 10; H. Lake, 80, Bridge-street, 10; John James Vorder Huyde, Caterham, 10.

MEXBOROUGH AND DISTRICT WATER COMPANY (Limited).—Capital 10,000*l.*, in 10*l.* shares. To supply Mexborough and district with water. The subscribers, all of Mexborough, are—Peter Waddington, 20; John Dickinson, 20; A. M. Bolsora, 20; W. Beerers, 30; C. H. Verity, 20; J. P Makin, 30; T. Harrel, 30. 50,000*l.*, in 100*l.* shares. To acquire land for building and other purposes. The subscribers are—F. Woodward, Lark Hill, Worcester, 20; F. Corbett, Worcester, 40; F. Dingle, Worcester, 5; H. Willis, Worcester, 20; E. Corbett, Longmore, Chadderly Corbett, Worcester, 5; C. W. Corbett, Worcester, 5.

BALTIC SAW MILLS AND MEDWAY COAL WHARF COMPANY (Limited).—Capital 40,000*l.*, in 100*l.* shares. To carry on business as builders, dealers in coal, lime, bricks, tiles, &c. The subscribers are—S. S. Weave, Osborne House, Tunbridge Wells, 10; J. S. Weave, Sandhurst-street, Tunbridge Wells, 10; Thomas Potter, Portland Villa, Tunbridge Wells, 10; F. W. Stone, Tunbridge Wells, 10; C. T. Shanton, 16, Beach-street, Tunbridge Wells, 10; Thomas Villa, Tunbridge Wells, 10; T. Harris, Tunbridge Wells, 2.

NORTH-WESTERN PROVISION SUPPLY ASSOCIATION (Limited).—Capital 10,000*l.*, in 2*l.* shares. To establish stores in the North-West district. The subscribers (who take one share each) are—J. L. Elkin, 3, Pembridge Villas, W.; T. A. Stephens, 180, Alexandra road, St. John's Wood; A Welkin, 112, Abbey-road, St. John's Wood; C.W. Cordery, East Sheen; Wm. Abbott, M.D., 45, Eaton-square; J. H. Weikin, 58, Threadneedle-street; A. Conder, St. Clement's House.

CENTRAL LAND COMPANY (Limited).—Capital 20,000*l.*, in 50*l.* shares. This appears to be a Birmingham land company. The subscribers (who take one share each) are—John Webb, Birmingham; F. Ellis, Moseley-road, Birmingham; John Read, The Poplars, Birmingham; H. Vale, Birmingham; William Andrew, Mosley-road, Birmingham; W. M. Scott, Lancaster-street, Birmingham; J. Moffat, South road, Birmingham.

THE COAL TRADE.

Mr. J. R. Scott, the Registrar of the London Coal Market, has published the following statistics of imports of coals into the port and district of London by sea, railway, and canal during May, 1877:—

By sea.	Ships.	Tons.	By Railway and Canal.	Tons.	c.
Newcastle	156	116,029	London & North-Western	111,6	2 17
Seaham	31	14,574	Great Northern	91,167	6
Sunderland	102	68,398	Great Western	88,919	0
Middlesborough	5	1,206	Midland	140,874	0
Hartlepool	93	32,285	Great Eastern	67,729	6
Scotch	6	1,619	South-Western	3,746	1
Welsh	7	2,702	London, Chat., & Dover	1,457	0
Yorkshire	17	2,415	Lond., Tilbury, & Southend	61	6
Small coal	11	1,135	South-Eastern	1,162	11
Cinders	11	977	Grand Junction Canal	459	0
Total	439	241,273	Total	502,202	18
Imports—May, 1876	456	2 4,477	Imports during May, 1876	370,109	15

Comparative Statement, 1876 and 1877.

By Sea.	Ships.	Tons.	By Railway and Canal.	Tons.	c.
Jan. 1 to May 31, 1876	2414	1,418,747	Jan. 1 to May 31, 1876	2,052,565	8
Jan. 1 to May 31, 1877	2302	1,345,433	Jan. 1 to May 31, 1877	2,170,326	0
Decrease—1877	112	73,314	Increase—1877	117,900	12

Subjoined is the export list, showing the distribution of coal imported into the port or district of London, by sea, rail, and canal, and afterwards exported coastwise or to foreign parts, or sent beyond limits of London district by rail or inland navigation, during May, 1877:—

Railway-borne coal passing *in transitu* through district	Tons	75,004
Sea-borne coal exported to British possessions, or to foreign parts, or to the coast	Tons	46,200
Ditto, sent beyond limits by railway		14,292
Ditto, by canal and inland navigation		1,074= 61,566
Railway-borne coal exported to British possessions, or to foreign parts, or the coast		25,979
Ditto, by rail beyond district		70
Ditto, by canal and inland navigation		181= 26,230
Sea-borne coal brought into port and exported in same ships		270
Total quantity of coal conveyed beyond limits of coal duty district during May, 1877		163,101
Ditto, May, 1876		154,508

Comparative Statement, 1876 and 1877.

Total distribution of coal from January 1 to May 31, 1876	787,483
Ditto, January 1 to May 31, 1877	779,767
Decrease in the present year	7,716

General Statement, 1876 and 1877.

Increase in coals imported by railway and canal during the present year	117,960	
Less decrease by sea	73,314=	44,646
Add decrease in coals exported		7,716
Total increase in trade within London district during present year		52,362

CHEMICALS, MINERALS, AND METALS.—Messrs. J. Berger Spence and Co. (June 6).—Acetate of Lime, 9*l.* 10s. per ton.—Alumina: Alum, 6*l.* 15s. for loose lump: ground, 7*l.* 15s.—Aluminous cake, 4*l.* 10s.—Ammonia: Sulphate, grey, 18*l.* 15s.; best London white, 19*l.*; muriate—white, 27*l.*; sal ammoniac, firsts, 45s.; seconds, 44s.—Acid: Tartaric, English, ground or crystal, 1s. 5d.; foreign, 1s. 4½d., crystals; oxalic, 5d.; sulphuric, 3*l.* 10s. to 3*l.* 15s.; picric acid, 1s. 6½d. per lb.—Arsenic: New Consols make 8*l.* 10s.—Bleaching Powder: At 5*l.* 5s.; for the whole of the year 1877, 6*l.*—Litharge: Best flake, 24*l.*—Metallic Salts: Iron salts, green and rusty copperas, 55s.; in casks or barrels, 60s.—Copper Salts: Sulphate of copper, 22*l.* 15s.—Magnesia: Epsom salts, 3*l.* 5s.—Nitrate of Soda: 14s. 6d. to 14s. 9d.—Potash: Muriates, 80 per cent., at 6*l.* 8s. 6d. f.o.b.; Prussiate, yellow, 10¾d.; chlorate, 9d.; bichrome, 4½d.—Soda: Cream caustic, 60 per cent., 11*l.* 17s. 6d.; white, 60 per cent., 12*l.* 7s. 6d.; soda ash, 1¾d. to 1⅞d.; soda crystals, 4*l.* 5s.; bi carbonate, 11*l.*; salt cake, 2*l.* 10s.; Glauber salts, 2*l.* 15s.—Sugar of Lead: Brown, 26*l.*; grey, 30*l.* 10s.; white, 37*l.*—Brimstone: Best thrids, 5*l.* 7s. 6d.—China-clay: 15s. f.o.b Cornwall; "Rosemellyn," 24s.; "BM," 34s.—Iron Ore: Hematite, 15s. to 22s. 6d.; Algerian, 53 per cent., 14s. f.o.b.—Manganese: Ores, 90s. for 70 per cent.—Pyrites: Spanish cupreous, 5½d.; non-cupreous, 6¾d—Phosphate of Alumina, 3*l.* to 3*l.* 10s. per ton.—Phosphates: High strength, 80 to 85 per cent., 1s. 4d. to 1s. 5d. per unit; Estremadura, 1s. 3d.; ordinary, 60 per cent., 1s.; precipitated phosphate of lime, 70 per cent., 5*l.* 15s.—Iron: Middlesborough Pig iron, No. 1, 47s. 6d.; No. 3, 42s. 6d.; No. 4 (foundry), 41s. 6d.; No. 4 (forge), 41s. net.—Hematite, No. 1, 70s.; No. 2, 67s. 6d.; No. 3, 64s. 6d.; No. 4, 64s. 6d.; No. 5 (mottled and white), 64s. 6d.—Bessemer, No. 1, 70s.; No. 2, 67s. 6d.; No. 3, 65s., less 2½ p. c.—Scotch warrants, 53s. 9d.; Scotch, g.m.b., No. 1, 56s.; No. 3, 52s. net.—Copper: Chili bars, 69*l.*; B.S. ingot, 79*l.*; tough cake, 77*l.*—Lead: Best English soft pig, 21*l.* 5s.; German soft pig, 21*l.* c.i.f., Liverpool or London—Spelter: Silesian, 20*l.* 10s.; English, "Swansea Vale," 21*l.* 2s. 6d—Tin: Straits, 70*l.*; Australian, 70*l.*; British, 77*l.*—Tin-Plates: Best charcoal, 26s.; charcoal, 25s.; best coke, 23s.; coke, 22s.—Tubes and Fittings: 72½ to 75 per cent.

INSTITUTION OF MECHANICAL ENGINEERS.

Last Friday, the 1st inst., the second and concluding meeting of the Institution of Mechanical Engineers took place at the Institution of Civil Engineers, Great George-street, Westminster, under the presidency of Mr. THOMAS HAWKSLEY.

The SECRETARY (Mr. W. P. Marshall) commenced the business by reading a paper "On Steam Boilers and Engines of High Pressure," which was communicated by Mr. LOFTUS PERKINS, of London.

The object of this paper is to bring before the Institution plans for generating high-pressure steam—say, from 250 to 1000 lbs. per square inch—and working it with great expansion and perfect safety, in conjunction with simplicity and durability. Sixteen years ago the author, conjointly with Prof. Williamson, read a paper on this subject at a meeting of this Institution, in 1861. The engine and boiler then described have been in use ever since, and recently became the property of a gentleman who for several years has had another boiler and engine on the same system at work. The boiler and engine of 1861 are to be re-erected at the new works of the Sub-Wealden Gypsum Company, at Battle, near Hastings, and are to form part of a steam plant consisting of three sets of boilers and engines, &c., on this system. Since 1861 many improvements have been effected, and are embodied in the engines recently constructed, and illustrated in diagrams which accompanied the paper.

In generating steam of the high pressure required to realise a fuller benefit of expansion, it has previously been found impossible to combine in the boiler great strength and safety with durability; if the former are secured, by reducing the internal dimensions and capacity of the boiler, the impurities passed in are fatal to the latter. In working a marine engine which was designed to use water distilled from sea water, the author found that, although extreme care was taken to separate all the impurities from it before it was introduced into the boiler, the internal surfaces were in the course of time seriously injured. In the same manner ordinary marine boilers using surface condensation have been injured when there has been an insufficient supply of sea water to form a protecting scale on the exposed internal surfaces. This led the author to seek for a remedy, which he succeeded in discovering, and adopted with absolute success. This was the use of nothing but fresh water, or distilled fresh water, in the boiler, used over and over again, without any admixture of sea water or the products of sea water, and this was easily accomplished, as the machinery in question had been designed to avoid any leak whatever, and the amount of waste that did take place from glands, &c., was so small in quantity that no practical inconvenience was found in providing the small supply of fresh water required to make good the waste that did occur.

The means taken to secure the soundness of all the joints and parts of the machinery were the same as those which had previously proved successful in the manufacture of the high-pressure heating apparatus which the author and his firm have been making for upwards of 45 years, and which has continued to work with the same water with which it was originally charged, without any destructive effect on the internal surfaces. Many sets of this heating apparatus have been working 40 years without decay; and some specimens of tubes from the boiler that was described in the former paper, in 1861, which were cut out of this boiler for the Admiralty Boiler Committee in 1874, were found to be in such a remarkably good state of preservation that the Committee made a special report on the system, which was laid before Parliament, and the specimens referred to are now shown on the table by the kind permission of the Committee. The Committee examined the condition of the boiler and cylinders of the engine at the writer's works, which were opened for the purpose in the presence of the Committee, and found the tubes of the boiler in a remarkably good state of preservation after having been in use nearly 13 years, and the piston packing and valve rings made of the special metal were found in excellent condition after 18 months' working without lubrication since last examined.

The possibility of using water which did not injure the internal surface of the boiler enabled the author to design the boiler on a system that combines maximum strength and safety. The full size diagrams, figs. 1 and 2, show the construction of the boiler. The horizontal tubes are 2¼ in. internal and 3 in. external diameter, excepting the steam collecting tube, which is 4 in. internal and 5½ in. external diameter. The horizontal tubes are welded up at each end ⅛ in. thick, and connected by small vertical tubes of ⅜ in. internal and 1 5-16 in. external diameter. The fire-box is formed of tubes bent into a rectangular shape, placed 1¼ in. apart, and connected by numerous small vertical tubes ⅜ in. internal diameter. The body of the boiler is made of a number of vertical sections, composed each of 11 tubes, connected at each end by a vertical one; these sections are connected at both ends by a vertical tube to the top ring of the fire-box, and by another to the steam collecting tube. The whole of the boiler is surrounded by a double casing of thin sheet iron, filled up with vegetable black to avoid loss of heat. Every tube is separately proved by hydraulic pressure to 4000 lbs. per square inch, and the boiler in its complete state to 2000 lbs., this pressure remaining in for some hours without showing any signs of leakage. Experience of a very extensive character has proved that this construction of boiler can be worked safely, with great regularity, and without priming, and that the steam produced is remarkable for its freedom from moisture. The area through the vertical connecting tubes is found ample for allowing of the free escape of the steam, and for the prevention of injury from overheating of the tubes in contact with the flame. Injury arising from a prolonged stoppage of the feed supply is a casualty to which all boilers are liable, but with this construction of boiler the small capacity of the sections reduces to a minimum any danger arising from such injury, and facilitates rapidity of repair.

In a diagram the arrangement for using the high-pressure steam in the engine is shown, drawn full size.] The engine has three cylinders, the first is a single-acting high-pressure cylinder, and the second also a single acting cylinder, four times the capacity of the first; these two cylinders are bolted together in the same straight line, and have a common piston rod. The third cylinder is double acting, four times the capacity of the second, and its piston-rod is connected to a crank at right angles to the other crank.

Having safely generated steam of high pressure at (say) 350 lbs. per square inch, a serious difficulty has to be overcome in using it, from the high temperature affecting the lubrication of the pistons and packing of the glands. This difficulty the author has succeeded in overcoming by introducing the high-pressure steam into the upper end of the first cylinder, where there is no gland, and where the piston is formed so as to require no lubricating material. The steam is cut off at about half-stroke in this cylinder, and when it is admitted for the return stroke into the bottom of the second cylinder, of four times the area, the temperature is so much reduced as to cause no difficulty when brought into contact with the piston-rod gland. From the bottom of the second cylinder the steam expands into the top of the same cylinder, which is of larger capacity than the bottom, and serves as a chamber, and is in direct communication with the valve box of the third cylinder; this last is double-acting, and is arranged to cut off at about a quarter stroke, and at the termination of the stroke exhausts into the condenser, with a total expansion of about 32 times. All the cylinders are jacketed with wrought-iron tubes, as shown in the diagrams, which are cast in the metal, and supplied with steam direct from the boiler, the condensed water from the jackets being conveyed to the hot well. The whole of the cylinders and valve boxes, &c., are enclosed with a double case of thin sheet iron, filled in with vegetable black to prevent the escape of heat, and at the same time to maintain all the parts at a high temperature.

In working these high-pressures with great expansion the ordinary mode of packing the pistons was found unsatisfactory, and to overcome the difficulty the compound piston was devised, shown in section in each of the three cylinders in the drawing, and by the sample piston on the table. The prevalent scoring and cutting of engine cylinders was effectually remedied by the discovery of the compound metal of which the packing rings are made, which requires no lubricating material. Many cylinders fitted with piston rings made of this metal have been several years at work, and have been often examined, the cylinders showing no signs of wear, the wear taking place on the rings only, which may be easily and inexpensively renewed as required; and experience has proved that with these pistons the longer an engine is worked the more perfect does the surface of the cylinders become, and the less wear results to the packing rings. This metal for piston packing rings is composed of 5 parts tin and 15 parts copper, and has since been used by several other makers for ordinary engines with great success. When this metal is used no oil or grease is required to lubricate the cylinders—a great advantage, particularly where the engines are fitted with surface condensers.

The high-pressure pistons in the steamers Atacama and Coquimbo, of the Pacific Steam Navigation Company, were fitted with these packing rings, and it was reported by the superintendent engineer that the cylinders, which were previously rough and slightly grooved, were in the course of two or three voyages, or about 10,000 miles run, brought up to a beautiful smooth surface, and had since kept in capital order, giving no trouble whatever. After having been once brought up to a smooth working surface, the packing rings did not wear the cylinders; the wear of the rings was also very slight, and the friction greatly reduced, and one-third of the lubrication necessary for cast-iron rings was found sufficient. In the torpedo vessels made for the French Government Messrs. Thornycroft found these packing rings for the engine pistons a great advantage, as there was no chance of the cylinders being scored; and they were enabled to run the two hours' trial easily at the high speed of about 430 revolutions per minute, without using any oil or grease in the cylinders. In an engine at the Dorking Grey Stone Lime Company's Works, the manager reported, after 2½ years' use of these packing rings for the piston, that they required no grease of any kind, and worked the cylinders to a polished face, and needed no looking to until worn out; a set of rings lasted about 100 days, working at the usual high steam pressure of 400 lbs. per square inch.

The diagram, Fig. 4, drawn full size, shows the surface condenser used; it is constructed of a number of vertical tubes in such a manner as to be absolutely tight, so as to ensure that the condensing water inside the tubes shall not mix with the water from the condensed steam outside them. The tubes are ⅞ in. internal and 1 5-16 in. external diameter, welded up at the top end and fixed securely in a tube plate at the bottom. These tubes are fitted with internal tubes, open at both ends, which are fixed in a division plate at the bottom in order to cause the condensing water to circulate to their extreme ends, the course of the circulating water being shown on the drawing by arrows.

Fig. 5 shows a small still, worked by a steam coil, which is used to distil water for replenishing any small waste that may take place in the feed supply. A duplicate apparatus forms part of the ordinary equipment of a sea-going vessel, to furnish steam from sea water for blowing the steam whistle, cooking, supplying distilled water for use of passengers and crew, and for all other purposes where distilled water is required.

In designing the machinery described, provision is made for passing any waste steam from the safety-valves, &c., into the surface condenser, and the great strength of the boilers allows a margin of 100 lbs. per square inch or more to exist between the load on the safety-valves and the pressure required to work the engines. When this system is fully carried out in steamships the author would deem it quite safe, and more than ample for making good the waste of water from all sources, to provide, beyond the water in the boilers, a supply of fresh water in the proportion of 10 gallons per 24 hours per 100 indicated horse power. As an instance of the practical feasibility of carrying out the system of machinery that has been described, it may be stated that a boiler containing only 300 gallons, and an engine working at 250 lbs. pressure and 250 indicated horse power, were worked night and day continuously 13 days (one Sunday excepted) without requiring any addition to make good the waste of working, nor at the end of the trial was there any appreciable difference in the water level of the boiler.

In the indicator diagrams, Fig. 6, the two upper diagrams are taken from the working of a pair of marine engines on this plan of 70 nominal horse power, and the coal consumed averaged 1·62 lbs. per indicated horse power per hour. In this case there was no vacuum and no low-pressure cylinder, and the terminal pressure was 21 lbs. per square inch above the atmosphere; the boiler pressure was 300 lbs. per inch. With the addition of a low-pressure cylinder and a vacuum the author considers it may safely be estimated that this system, properly carried out, will realise an average duty of one horse power for each pound of coal per hour.

At the close of the reading of the communication, the PRESIDENT said he need hardly state that the paper was a very remarkable one, and called for a full discussion.

At the request of Mr. Ravenhill, Mr. PERKINS, the author of the paper, gave a further description of the mechanical arrangements of the engine and the boiler, especially with regard to the short connecting tubes.

The PRESIDENT asked if Mr. Perkins had a specimen of the pipe to show?——Mr. PERKINS replied that he had not, but sections were all communicated by means of differential joints, which were similarly used on the indicator.

Mr. LEWIS OLRICK thought it was to the advantage of the author of the paper, who could bring before them a certificate to the effect that the engine and the boiler referred to had been in practical working for a number of years, otherwise many of them might have some doubt as to the feasibility of the system. It seemed to him, with regard to the boiler, that one of the principal conditions was to have perfectly pure water, which could only be obtained by distillation from fresh water. This system proved clearly that there must be a certain amount of impurity in salt water, which could not be removed by condensation. When they looked at the plan before them it seemed to him strange that it (the boiler) should have behaved so well for many years. One important feature was that Mr. Perkins did not tilt his tubes, and that his boilers never burn. The point to be considered in boilers of this character was as to the circulation, which he questioned would be of a proper character, and, with all due deference to Mr. Perkins, he (the speaker) thought there must be some commotion in the water of the same description to be found in a tea-kettle—the steam escaping from vertical tubes ascended. If Mr. Perkins' system could prove itself upon being tried on a large scale there was no doubt that it would effect a great improvement. At the present time if anything happened to a boiler belonging to any of the fleet the ship must be ordered away to be repaired, but if the system now put forward was effectual any ordinary workman could repair a boiler whether it belonged to one of the fleet or not. In these days of accidents, such as that which happened to the Thunderer, this was of the highest importance. In the paper Mr. Perkins stated that the high-pressure pistons in the steamers Atacama and Coquimbo, of the Pacific Steam Navigation Company, were fitted with packing rings, and that it was reported by the superintendent engineer that the cylinders, which were previously rough and slightly grooved, were in the course of certain voyages brought up to a beautiful smooth surface, only one-third of the lubrication necessary for cast-iron rings being found sufficient. If they could do without lubrication under certain conditions it would be of importance. In conclusion, he said that, as they had seen so many mishaps in the Royal Navy with regard to boilers, Mr. Perkins had no doubt made out a good *prima facie* case for the trial of his system upon a large scale.

Mr. RAVENHILL said that in the paper he observed that the author proposed to use fresh water over and over again, and nothing but fresh water; he also stated that, in his opinion, he believed no detriment would arise to the boiler in consequence of the use of distilled water. This view was exactly at variance with the results that had been obtained by experiments in the late Dr. Letheby's laboratory some years since with regard to the effect pure distilled water would have upon wrought-iron. It was demonstrated that the action of water was extremely rapid upon the wrought-iron that had been tried. With reference to the small connecting tubes, as a practical boiler maker of long experience, he could not but think that some trouble would be found to arise from their introduction at their junctions with larger tubes. The paper did not state the longest distance vessels that had been fitted with these boilers had run, nor the total amount of work which had actually been performed, but if these boilers were not in every way efficient, or if anything like a hitch occurred in the small tubes, he took it that a very serious trouble would arise. The great point that had always been aimed at was simplicity of repairs, and if repairs were necessary it would be found a troublesome job to attend to the boiler when a ship was under weigh, the chance being that they would have to go into the nearest port or harbour for repairs. He believed that the Admiralty officials had recommended the Government to adopt these boilers. It could not be doubted that the question of high pressure in boilers was of the highest importance to naval engineers.

Mr. PAGET remarked that as to pure water damaging plates, he thought the statement that distilled water damaged iron plates was beyond doubt, but from a fact that had come under his notice it had led him to doubt this practically. Some neighbours of his put down a boiler, a small one, which after having been for 15 years working soft water was opened for inspection, and was found to be in a first-rate condition. This was a stronger test than a mere laboratory experiment.——Mr. RAVENHILL explained that the water made use of by Dr. Letheby was distilled by him until it was made as pure as possible. The water which Mr. Paget referred to was, he considered, soft water from the well.——Mr. PAGET: It was rain water.

Mr. RAVENHILL said it must have contained some impurities. Mr. Edward Humphreys, whose name was well known amongst them, when he commenced making engines with surface condensers, spent some days in distilling water for his larger boiler, the water being obtained from the East London Company's Works.

Mr. YOUNG said they had been told by Mr. Ravenhill that distilled water destroyed iron, while Mr. Paget said it did not. Both might be right, and until they knew the degree of heat either fact could be taken as conclusive. They were aware that boilers with brass tubes left to the natural temperature of the air would corrode, while under steam boilers did not always show corrosion.

Mr. HEAD stated that in rain water there was always a little carbonic acid, sufficient to dissolve carbonate of lime. This carbonate of lime was not soluble in pure water.

Mr. MARTIN remarked that since the first description appeared of the boiler referred to by Mr. Loftus Perkins he had watched its operations with very great care, and had been much surprised to find how well it answered. He considered it the best type extant of the small boiler principle, and that others were mere imitators of it. All the other boilers of a similar type experienced the difficulty of evaporating the water in a small space. Whenever these boilers for high pressure were mentioned at a meeting of engineers the subject seemed to bring about a feeling of antagonism on the part of those who advocated the Lancashire boiler, the view seemingly to be entertained that the small boiler would supersede the Lancashire work, which antagonism he regretted. He had no doubt whatever but that the Lancashire boiler would continue for a long time to have the run of the market, but he thought that more attention ought to be given by those who were trying experiments to the introduction of a boiler that would really be an improvement upon those which were now in general use. With regard to corrosion nothing, he considered, was more corrosive than soft water or distilled water, which he had found from experience.

Mr. ADAMSON had a special interest in maintaining the dignity and position of the Lancashire boiler, and those who knew him best were well aware that he was not alarmed whether a Lancashire or any other boiler should have the preference. He trusted that what was to the best interest and advantage to users would have the preference, and in this view he felt sure he would have the concurrence of the entire body of engineers. He was deeply interested in the question they were now discussing, and was exceedingly glad the matter had been brought before them by a gentleman who had had long experience on the subject. He thought the engine did require as much accumulated experience as the boiler itself to work off such high pressure and such high temperature as were produced. He took a different view from one of the speakers, that the boiler in question was necessarily imperfect because it had a poor chance of having a good circulation; on the other hand, he was strongly impressed with the opinion that they were bound to have a certain quantity of cubic contents of water to answer for the surplus heat in it. In this pipe construction he apprehended that the first thing to do was to get a high temperature, and after being passed through the pipe the water was bound to take it up. This boiler, he considered, would be able to carry its water perfectly quiescent so long as the pressure was slightly removed, however limited the quantity of time. The higher the principle of the simple reduction there was in a given period the less tendency there was to a violent ebullition. If his view be correct, the small pipe was not likely to suffer on the upper surface, or even with the joints, unless the pressure was rapidly reduced. They might reduce a quantity of water in proportion as would limit the rapidity of the reducing of the pressure. Under all circumstances, he could hardly apprehend that as the boiler of this class was the right structure to convey temperature, he held that contingencies must arise, that rapid ebullition would follow, that particles of steam would adhere to the upper portions of the tube, and that there would be great disturbance in the interior, likely to produce destruction by the increase of temperature. He thought they were hardly impressed with the importance of the subject; he believed there was hardly any sort of iron in this country that was not subject to great reduction of strength when a temperature was attained at from about 500° to 600°. The construction of the sort of boiler referred to would, he was of opinion, require a good deal of modification before it could be practically introduced for all classes of boilers, stationary or marine. With regard to the engine itself, he congratulated the author of the paper for his courage in handling the pressure he had submitted to them. The most important consideration connected with this question was that of the temperature. He might himself question the adoption of the treble action, though he had worked some treble cylinders for 14 years. The engineer of the world had discovered that two cylinders, as a compound engine at limited pressure, did work more economically as a practical engine, it being subject to less wear and tear than a single cylinder engine, and did not lose so much pressure, besides which two cylinders gave practical security and uniformity of action. If this was true there must be a question as to how far such a compound was to be limited by the question of the pressure of the temperature. In working off high pressure they must necessarily have high pressure, consequently there must be high temperature vessels. As to the water, that of the chalk they all knew was impure, and even when distilled might still contain some of its impurities, which were exceedingly injurious; hence engineers know that in using very high pressure great care should be observed to obtain perfectly pure water.

Mr. CRAMPTON said that the boiler in question had worked well, which was certainly a recommendation in its favour, though he was not clear as to how it got rid of its water, there being nothing to show how the calculation arose. He had a strong view with regard to high pressure, and thought the time had come when the matter should be taken up by somebody, and a definite conclusion arrived at with regard to it. In dealing with this question, not only the boiler but the engine was to be considered. Before, however, any member dealt with the matter, the Council of the Institution should adopt some principles upon the subject to guide them.

Mr. COX did not think it ought to go forward to the public that there was no such thing as a "safety boiler." He might say that Roots' boiler was growing in favour year by year, but he did not feel the term "safe and sure" could properly be applied to it. With respect to corrosion, his belief that some cases which had been reported were due to the form of acids caused by the oils used in the engine, which were apt to operate upon the iron, and so destroy it. He believed there was a total difference between external and internal corrosions, and that they proceeded from different causes. The ordinary opinion that pure water corroded iron he did not believe. With regard to getting rid of the steam, he believed that when the boiler was in operation they must work at the higher pressure, otherwise the boiler would not get rid of its steam, because steam at the highest pressure was compressed into a small substance.

Mr. CRAMPTON thought it worth while to inform the Institution and the public generally that they would shortly be in the possession of some useful information which would considerably elucidate the subject; they had now met to discuss a number of experiments with boilers, having recently been made.

Mr. PLANNERY thought it was generally believed that any increase of economy which they might attain would be due to the increased height of pressure and the increased ratio of expansion. First, they must generate steam and then use it in the boiler. He ventured to think that the greater difficulty consisted in the generation of steam, and the lesser difficulty in the use of it in the engine. The only difficulty was the lubrication in the packing of piston-rods, but he ventured to think that the most attractive arrangement Mr. Perkins had made was likely to overcome this difficulty to a very great extent indeed. The boiler in question was identical in principle with those that were tried at sea. He spoke now from a marine point of view, and while the Montana and Dacota were at sea the bottom tubes of their engine boilers got heated, then cracked, fell through, and scalded some of the people in the stoke-hole. It might be that the system brought forward as to non-circulation was a correct one, and according to the paper injury arising from a prolonged stoppage of the feed supply was a casualty to which all boilers were liable, but with this construction of boilers the small capacity of the sections reduced to a minimum any danger arising from such injury, and facilitated rapidity of repair. They all knew the feed pumps were likely to be out of order. In the case of an ordinary marine boiler the advantage of feed pumps especially would not be quite so great, but in the case here he thought it would be very much less.

The PRESIDENT trusted the discussion would not close without some notice of the pistons. They all knew that the air-engine was a very good engine in all respects, and if these pistons would answer in the steam-engine it appeared to him that it would answer in the air-engine.

Mr. WELSH did not think that the Institution had often before it a boiler of this character, which had to back it a certificate of many years working, but it was rather extraordinary that some expressions of sympathy had been felt with Mr. Perkins. With respect to a compound engine, the question of course was a comprehensive one. As to the number of cylinders, that must entirely depend upon the ultimate range of temperatures to the condenser pressure, and experiments alone could determine that point.

Mr. PERKINS, in replying to the discussion raised, said that with regard to the action of pure water he thought it was a settled point that pure water in a hot boiler heated up had no effect upon iron, whether in the presence of bright iron or of iron coverad with oxide. As to the connections being weak in this boiler, he had used one in a boat, which he had worked up and down the Thames for five years, and though big steamers made the boat roll about, the boiler, which was similar to the one he had described, had never yet given him any trouble. With regard to the repair of these boilers, he had had made a complete one to fix in a ship which was capable of evaporating 100 cubic feet an hour. With an engineer and the crew of a ship, consisting of five men, a similar one could be made by them in a month, provided they were supplied with all the pieces, it being easy to make, with the exception, however, of the differential joints. None of these boilers had ever leaked except when they got red-hot, which would be the case if they were allowed to get short of water. In all these boilers, immediately they began to fire hard the water suddenly rose to a great height, rising higher than any other boiler, and then seemed to clear itself. The harder they tried them it made no difference to the steam. With the heating apparatus, when the fire was lighted no circulation took place at all until the water began to boil; it then foamed up, the circulation being very rapid, taking about 20 minutes to circulate 400 ft., so that in a boiler of this character, before it made steam, when it got up to 212° he did not think there was any circulation. Directly it began to boil it foamed first up one tube and then up another. This boiler would go 50 hours without pumping provided the steam was not taken away. The cubic contents of the boiler was very small, the temperature of the escaping gases being 500°. As to incompetent men being in charge of this boiler, everybody thought it was a difficult machine to work. He thought it was only difficult where men came to work it with a knowledge of the old-fashioned plan. If grease was to be used it stopped the boiler and the condenser. If they took a man out of the brickfield and taught him how to drive it, he managed it as well as possible, only an engineer being wanted to look after the repairs.

The PRESIDENT did not often trouble them with his observations, but he thought he might be permitted to say a few words, because

it was possibly in his power to contribute a little information. He had had an immense deal to do with this question of corrosion by hot water, steam, and by cold water. His belief was that pure water, so long as it remained so, was not the cause of any corrosion whatever, and they had this important illustration: if they would distil water several times over in a flask and drop a needle in it, and close up the mouth of the flask with a blow-pipe, the needle would remain bright, and there would be no corrosion at all; but if, on the other hand, the oxygen was allowed to become incorporated with the water corrosion immediately set in. Under another state of circumstances, if they had impure iron, which would get galvanic action of water, and separate the oxygen from the hydrogen in water, they had an enormous amount of corrosion immediately produced, accompanied with pitting similar to the small pox. Under pure water they might not have corrosion, and under other circumstances they might have considerable corrosion. If they admitted grease into a boiler fatty acids would be formed, as was the case when his friend Mr. Samuel Hill patented the original external condensers; then the water went round and round, and circulated continually through the end of the boilers, which in a few months were almost totally destroyed. It was only after considerable investigation it was discovered that this was due principally, though not wholly, to the action of the fatty acids. This was something for Mr. Perkins, because he took care that no fatty acids should get into the boiler. With regard to the question of pistons, if it was true that this particular metal would enable engines to work without the use of grease in the cylinder, then it was possible that they were able to make that very useful machine valuable under certain circumstances, but not under all circumstances, to the air-engine, which he had seen work beautifully and effectively and economically, but not for long together. Touching these pistons, too, there was another matter he might mention. He had been a great sinner in his time in the very matter he was about to call their attention to. Pistons were generally made too shallow; the surface bearing on the piston ought to be deep for this reason—that the passage of the steam was in the inverse ratio of the depth. He was quite satisfied that, instead of making bearing surfaces from 4 to 6 in., if they were made 9 in. there would be the less loss of steam than there now was. With regard to jacketing, many years ago he purchased, in Cornwall, a single-acting engine made upon Sims's plan, that was with high-pressure cylinders standing on the top, and with low-pressure cylinders. The high-pressure cylinders were jacketted, but the low-pressure cylinder was not. When the engine was started it went beautifully to work for about a quarter of an hour, when it began to shorten the stroke inch by inch till at the end of half an hour or an hour and a half it fell 18 in. short of its stroke. That was rather a puzzling circumstance. By stopping the engine, however, and blowing through, it started off as well as ever. Then it occurred to him that this effect was produced by the diminution of the size in the largest cylinder by reason of it being colder at one end than the other. By measuring the cylinder it was found that the difference of the diameter was $\frac{1}{8}$ in. at the end of this period, when the engine fell 18 in. in the length of the stroke. This showed the advantage of jacketting to keep the cylinder in a uniform diameter. He had now to make one or two important communications to them. In the first place he must mention that two subjects which were intended to be submitted to them at this meeting would have to be deferred until their next gathering. One of them was, "Supplement to Notes on the Early History of Railway Gauges, in reference to the Origin of the 4 ft. 8½ in. Guage," which was communicated by the secretary. The next was entitled, "On an Improved Form of Slide Valve for Steam and Hydraulic Engines," by Mr. Francis N. Webb, of Crewe, which could not be discussed owing to Mr. Webb's unfortunate illness, consequently it would be deferred to their next meeting at Bristol in July next, which would be the most desirable course to adopt. He (the President) had now to propose that a cordial vote of thanks be passed to Mr. Perkins for his paper; but the most important matter which he had to announce was that he was instructed by the Council to announce that they had completed an arrangement for the occupation by the Institution of an excellent set of chambers on the ground floor of No. 10, Victoria Chambers, Victoria-street, with the privilege of immediate possession; also, that a committee had been appointed for the purpose of furnishing these apartments, and making all other arrangements requisite for effecting the prompt transfer of the Institution from Birmingham to London, and for disposing of the interest in the premises of the Institution at Birmingham.

Mr. PAGET moved a vote of thanks to the Council for their exertions in bringing about the transfer to London.——Mr. RAVENHILL having seconded the motion, and Prof. BRAMWELL having supported it, it was carried.

The PRESIDENT then proposed a vote of thanks to the Council of the Institution of Civil Engineers for the use of the rooms, which motion was carried, as also was a similar compliment passed to the President for presiding.

IMPROVED BUDDLE.

An improved buddle recently invented by Mr. R. H. WILLIAMS, M.E., of St. Austell, is claimed to be the simplest and most effective yet introduced. It is a fixed convex buddle, the improvement consisting in delivering the ore with the water through a revolving tube directly into a small receptable in the centre of the bed, whence it is forced over on to the buddle by the falling water and mineral, the result being an unusually even distribution of the material to be dressed. To fix the buddle a pit is sunk about 3 feet square, and about the same depth under the intended floor line of buddle. In the bottom of the pit some 2½ or 3 in. planking is placed. When quite level the foot of the stand is put in position on the plank and spiked down, care of course being taken that it is quite upright. The stand is then built around with masonry to support it and high as the as floor line, the arm is screwed up and the centre is plumbed to fix the cup. The bottom of the tube is fixed 16 in. above the top of the cup, the cup being nailed down upon a piece of wood exactly underneath the centre of the tube, from which the pitch to the stand is taken, and the outer line for the floor is marked. The circumference is struck 6 ft. from the centre of the cup. The outside is constructed 12 in. above the floor line, and the bottom is laid in of wood, cement, or any smooth durable material, Roman cement being that to which preference is given, care being taken to have a perfectly conical bottom, and that the outer part is perfectly level all aronnd. The pitch from the centre to the outer extremity of the buddle on a 6-ft. run depends upon the character of the ore treated, and the work to be done. For gold, silver, lead, tin, copper, or other ores whose specific gravity allows of separation by washing, stamped through a 7, 8, or 9 grate, 10½-in. pitch; if through a 10 or 11 grate, 9-in. pitch; and if through a 12 or 13 grate, 7-in. pitch. For slimes, the first operation, a 3-in pitch is used, and for cleaning a 4½-in. pitch; some tin slimes require a 6-in. pitch for cleaning. The tube must not be driven faster than four revolutions per minute. In the treatment of tin ores, crop tin buddle should have 10-in. pitch; skimmings, coffer, or shaking trunkwork, 9-in. The hoppers or feeders are provided with means of regularly supplying the ore in solution, and also clean water. The brushes must always be kept lowest toward the tail of the buddle; this can be done by occasionally taking off a turn of the string over the end of the arm while the buddle is at work.

Mr. Williams states that he is confident as to the simplicity and efficiency of the buddle, the great improvements in it over every other yet introduced being that as it is supplied with a revolving tube, which regulates the supply of crushed ore, it is quite impossible to add it more water than is necessary to separate the ore and consequently prevents the ore being washed back with the tailings. The revolving tube causes the direct fall of the ore to the centre of the buddle, forming a self-regulating distribution of the ore all over the conical floor. The ore to be treated being submitted to a clear stream of water, in addition to the water necessary to hold it in solution, the washing is much more effective, and the separation at one operation is superior to any process before-invented. This buddle is suitable for every department of separating and cleaning finely divided minerals, and is in use for separating gold, tin, lead, and other ores. It is simple in construction, cheaply erected, and has no part that can decay, or that cannot in a few hours be replaced if worn or broken by accident.

ROTARY PUMPS AND ENGINES.

An apparatus claimed to be very efficient as a fan or blower has recently been invented by Mr. JOHN HARRIS, of Montreal; it consists essentially of a circular continuous chamber, within which revolves a wheel or a hollow drum mounted upon a central axle. Upon the periphery of the drum, or upon the flange of the wheel, are fixed vanes or blades, the number of which may be varied as required. If the engine is used as a prime mover or to transmit power, these blades are put in motion and caused to circulate by water or other fluid passing and flowing through the chamber, whereby the revolution of the drum or wheel is obtained, but if the engine be used as a pump, motion is imparted to the blades by means of the wheel or radial arms of the drum to which they are attached, and by which they are connected with the central part of the engine. The interior side of the circumferential chamber nearest the centre of the engine forms a circle, but the exterior side thereof deviates from a circle, and commencing at a certain part of the chamber gradually increases in depth until a maximum depth is formed which exceeds the minimum area of the chamber by an amount equal to the area of a pipe, which enters the chamber at that point tangentially to its circle, and forms the outlet pipe or discharge, by which the fluid escapes or is propelled from the engine. The breadth of the chamber between the two sides is likewise not uniform, but commencing at a certain point gradually increases laterally until a maximum is reached equal in area to that part of the chamber at which the depth is greatest, and which exceeds the minimum area of the chamber by an amount equal to the area of the supply pipe, which enters the chamber at that point tangentially to its circle, but in the opposite direction to the entry of the discharge pipe. That part of the chamber which intervenes between the place where the outlet pipe leaves and the place where the inlet pipe enters, is uniformly of its minimum area, and the distance thus intervening between the discharge and supply may be varied within certain limits according to circumstances, but it is essential that some portion of the chamber having the minimum area only should thus intervene.

When the engine is used with water as a prime mover the whole of the chamber being filled with water a further supply entering from the inlet pipe will flow around through that part of the chamber between the inlet and outlet pipes. Now the motion and momentum of the water thus entering and flowing through the chamber will be imparted to the water already contained in the chamber, and hence will be imparted to the vanes or blades which are fixed on the periphery of the central part of the engine, whereby such central part of the engine will be caused to revolve. The operation of the engine when used as a pump is reversed, the vanes or blades being caused to revolve by giving motion to the central part of the engine; these impart their motion to the whole of the water in the circumferential chamber. Now the water occupying that part of the chamber which has the greatest depth is more in volume than can pass through the more contracted part of the chamber between the discharge or receiving main and the supply or suction pipe, consequently a portion of the water is forcibly ejected into the discharge, and this effect takes place continuously so long as the engine remains in motion. On the other hand as the vane or blade enters that part of the chamber where its breadth is greatest, and at which the supply pipe enters and drives the water before it, the water from the more contracted part being less in volume than is required to fill that part, a partial vacuum is generated, into which the water from the supply is accordingly impelled, this effect being continuous the operation of the pump causes a constant propulsion and flow of the water or other fluid.

The operation of the engine when used as an air blower is substantially the same. When used as a pump or air blower it possesses the advantage over other forms of rotary pumps and blowers now in use that it may be driven with a very much less velocity of revolution, and at the same time is more effective and economical than the others. When the engine is used as a prime mover the blades or vanes are by preference perforated, or constructed in the form of skeleton paddles, so as to allow the water to flow through them and more readily acquire the necessary momentum, but when used as a pump the blades or vanes are made solid without perforations.

If desired in lieu of making the exterior part of the chamber of a gradually decreasing curve circumferentially, that part may be circular, and the chamber made of a gradually increasing and decreasing width, the inlet and outlet then entering on the two opposite sides respectively, or that portion of the chamber through which the fluid is caused to flow in its passage from the inlet pipe to the outlet pipe may be made of a uniform but greater area than that of the vanes or blades, whilst the area of the remaining portion of the chamber which is also uniform is equal to that of the vanes or blades, a similar result being obtained by either of these variations in the construction. Any suitable number of these apparatus may be employed in combination mounted on the same shaft or axle or otherwise, the discharge from one forming the supply to the other throughout the series, whereby increased power and efficiency are obtained.

BLASTING COAL.—Referring to this subject Mr. Thomas Wynne (North Staffordshire, Cheshire, and Shropshire) states that blasting is still carried on to a large extent, and was fostered and encouraged during those years of delirium in the coal trade when anything would sell at almost any price, and it mattered not whether coals were cut at the sides or not, so that they were got down and brought to surface, for in those days slack sold for as much as large coal formerly did or does now; but this delusion is fast passing away, and as the payment by results becomes more general, both masters and men will find that the indiscriminate use of powder tends to the production of small coal, and so shakes the lumps that they fall to pieces before reaching the end of a journey by rail.

LONG-WALL AND STOOP-AND-ROOM.—Coal in Glasgow was 6s. 3d. per ton in 1876, against 7s. in 1875, and miners' wages remained about 4s. 6d. per day during the year. It appears from the report of Mr. Ralph Moore that 6,018,918 tons of coal were put out by the long-wall, and 5,648,730 tons by stoop-and-room, and that for equal quantities of coal the former was the safest. In 1875 stoop-and-room was safest. With the exception of Stirling and Linlithgow there has been a slight increase in the quantity of coal raised in all the counties. Lanarkshire raises 66 per cent. of the whole quantity. Taking the whole of Scotland 55 per cent. of the whole coal raised comes from that county.

PUMPS.—The invention of Messrs. BLUNDELL and HOLMES, of Limehouse, consists in employing three or more pistons working in one pump barrel, which pistons are so worked or operated as to alternately approach and recede from each other by means of two cranks working two cross heads or connecting rods which are attached to the pistons. The valves are so arranged that the water can gain access to the spaces between the pistons by channels outside the pump barrel. The pump heads may be fixed, or may be so arranged as to form or act as a delivery valve, or in some cases they may dispense with it entirely. The delivery from the second piston tion may in some cases be so arranged as to discharge through the top position by means of a trunk piston rod closed with a valve. The invention also applies to bilge or other pumps having one piston and double action, the pump head or cover being so arranged as to act as a delivery valve for the up stroke, and the delivery water for the down stroke will be discharged through a hollow piston rod or trunk surmounted with a valve. The invention may also be applied to pumps having two pistons with a quadruple action. In this case fixed covers may be employed, and four valves in two chambers are required instead of eight valves in four chambers, as is usual in other pumps hitherto employed for similar purposes, or the covers may be loose, when they will act as delivery valves.

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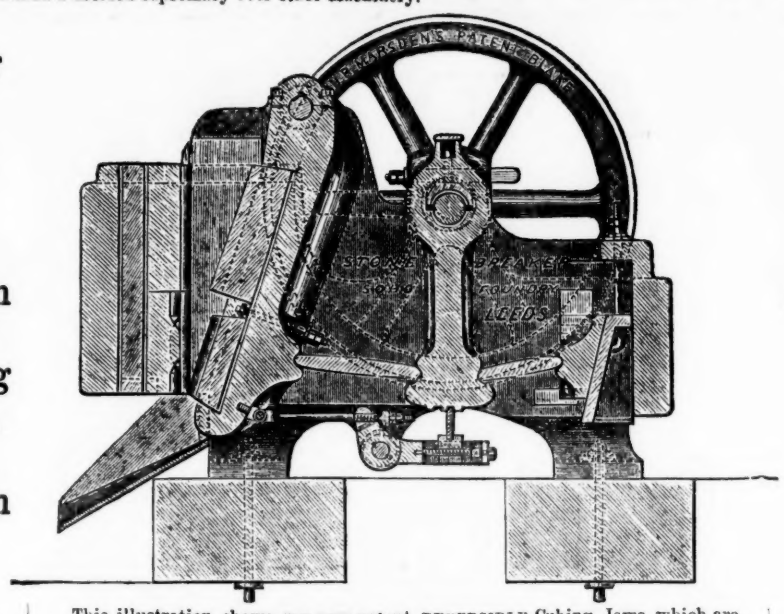

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